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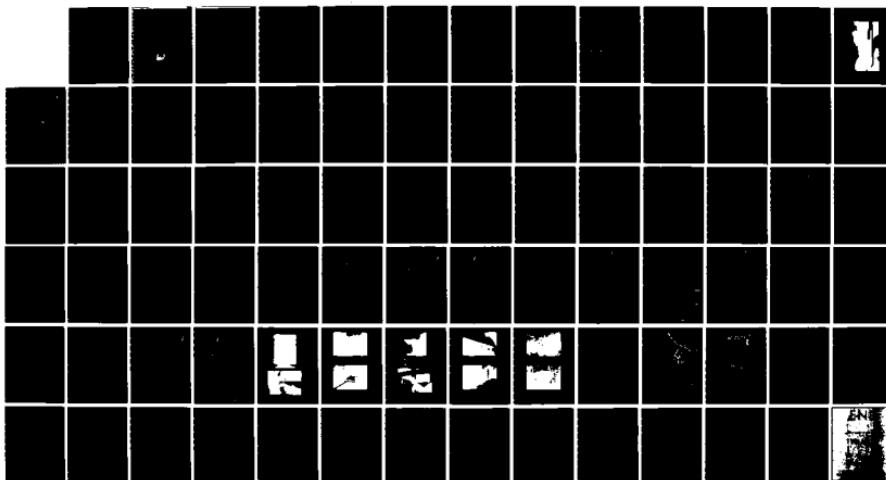
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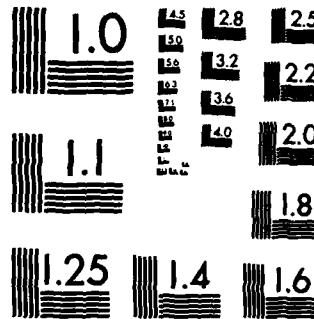
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CONNECTICUT RIVER BASIN
GLASTONBURY, CONNECTICUT

WILLIAMS POND DAM
CT 00900

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JULY, 1981

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Williams Pond Dam is a stone masonry/concrete and earth embankment structure that is 17.1 ft. high and approximately 190 ft. long. The dam is judged to be in FAIR condition with several areas that require attention. The dam is classified as small and has a high hazard potential. The test flood according to these guidelines ranges from $\frac{1}{2}$ the PMF to the PMF.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEED

AUG 21 1981

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

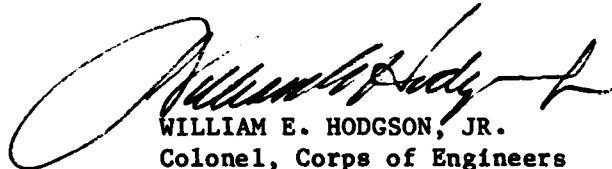
Dear Governor O'Neill:

Inclosed is a copy of the Williams Pond Dam (CT-00900) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is vitally important.

Copies of this report have been forwarded to the Department of Environmental Protection, and to the owner, Adrian Goldman and Michael Stearn, Glastonbury, CT. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Protection for your cooperation in this program.

Sincerely,



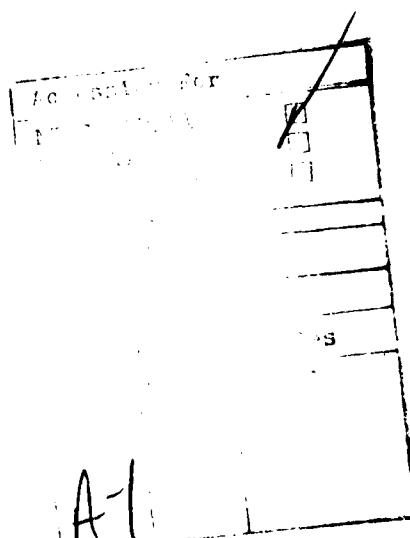
WILLIAM E. HODGSON, JR.
Colonel, Corps of Engineers
Acting Commander and Acting Division Engineer

Incl
As stated

WILLIAMS POND DAM

CT 00900

CONNECTICUT RIVER BASIN
GLASTONBURY, CONNECTICUT



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification Number: CT 00900
Name: Williams Pond Dam
Town: Glastonbury
County and State: Hartford County, Connecticut
Stream: Hubbard Brook
Date of Inspection: May 18, 1981

BRIEF ASSESSMENT

Williams Pond Dam is a stone masonry/concrete and earth embankment structure that is 17.1 feet high and approximately 190 feet long. The downstream face is a vertical stone masonry wall which has been surfaced with concrete in the vicinity of the spillway and the upstream face is earth on a 2:1 slope. A two foot high by 1.5 foot wide concrete wall runs most of the length of the top of the dam. Near the south side of the dam is the main spillway which consists of a concrete weir that is 8 feet long. Concrete spillway abutments rise 4 feet above the spillway and atop the south abutment is a low-level discharge gate that controls a 2'x2' conduit through the base of the dam. Operating the gate requires the use of a portable hydraulic jack and will lower the pond in approximately four hours. There are three sealed off and abandoned intake structures which were once used for power supply and fire protection.

A wooden footbridge allows passage from one side of the spillway to the other. The downstream channel meanders alongside several apartment buildings with the first floor window sills only about 4 foot above the top of the channel. The channel is 3'x7' and is covered at some locations. On the north side of the pond is a semicircular auxiliary spillway with a total weir arclength of 53 feet that overflows into an 84 inch reinforced

concrete pipe which discharges into Hubbard Brook. Presently, the pond is used for recreation purposes only. The drainage area is 2.2 square miles and the reservoir has 25 acre-feet of storage capacity at the top of the dam.

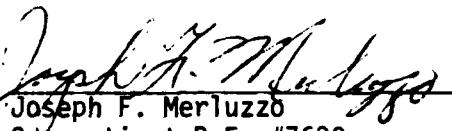
The assessment of the dam is based on the available engineering data, the visual inspection and hydraulic/hydrologic computations. The dam is judged to be in FAIR condition with several areas that require attention. These areas include a low area of the crest at the south end of the dam that would result in premature overtopping of the dam, missing mortar from the downstream masonry, a rectangular opening through the concrete wall along the top of the dam as well as spalling over most of the concrete wall and spillway abutments, brush growing along the upstream side of the wall, debris in the downstream channel and overgrowth and spalling on the auxiliary spillway.

The dam is classified as SMALL and has a HIGH hazard potential in accordance with guidelines established by the Corps of Engineers. The test flood according to these guidelines ranges from 1/2 the Probable Maximum Flood (PMF) to the PMF. The test flood for this dam is 1/2 the PMF and is calculated to be 2,030 cfs. The combined spillway capacity at the top of the dam is 840 cfs or 41 percent of the test flood outflow. The test flood outflow would overtop the dam by 1.5 feet.

It is recommended that the owner engage the services of a qualified registered engineer experienced in the design of dams to design a solution to the low area at the south end of the dam, prepare a detailed hydraulic/hydrologic investigation to assess further the potential of overtopping and the need for and the means to increase the project discharge capacity, design and rebuild the concrete retaining wall at the outlet of the auxiliary spillway

conduit and improve access to and means of raising and lowering the low-level discharge gate. It is also recommended that the owner repoint the masonry on the downstream face, repair the concrete wall at the top of the dam, remove the brush along the upstream side of the wall, clear the debris from the downstream channel, remove the overgrowth from and repair the auxiliary spillway, establish a formal warning system and initiate an annual technical inspection program.

The owner should implement the recommendations and remedial measures described above, and in greater detail in Section 7, within one year after receipt of this Phase 1 Inspection Report.



Joseph F. Merluzzo
Connecticut P.E. #7639
Project Manager



Gary J. Giroux
Connecticut P.E. #11477
Project Engineer

This Phase I Inspection Report on Williams Pond Dam (CT-00900) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

Carny M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph W. Finegan

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

Aramast Mantesian

ARAMAST MANTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Inspections. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Inspection; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Test Flood is based on the estimated Probable Maximum Flood for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and variety of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Inspection does not include an assessment of the need for fences, gates, "no trespassing" signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with Occupational Safety and Health Administration's (OSHA) rules and regulations is also excluded.

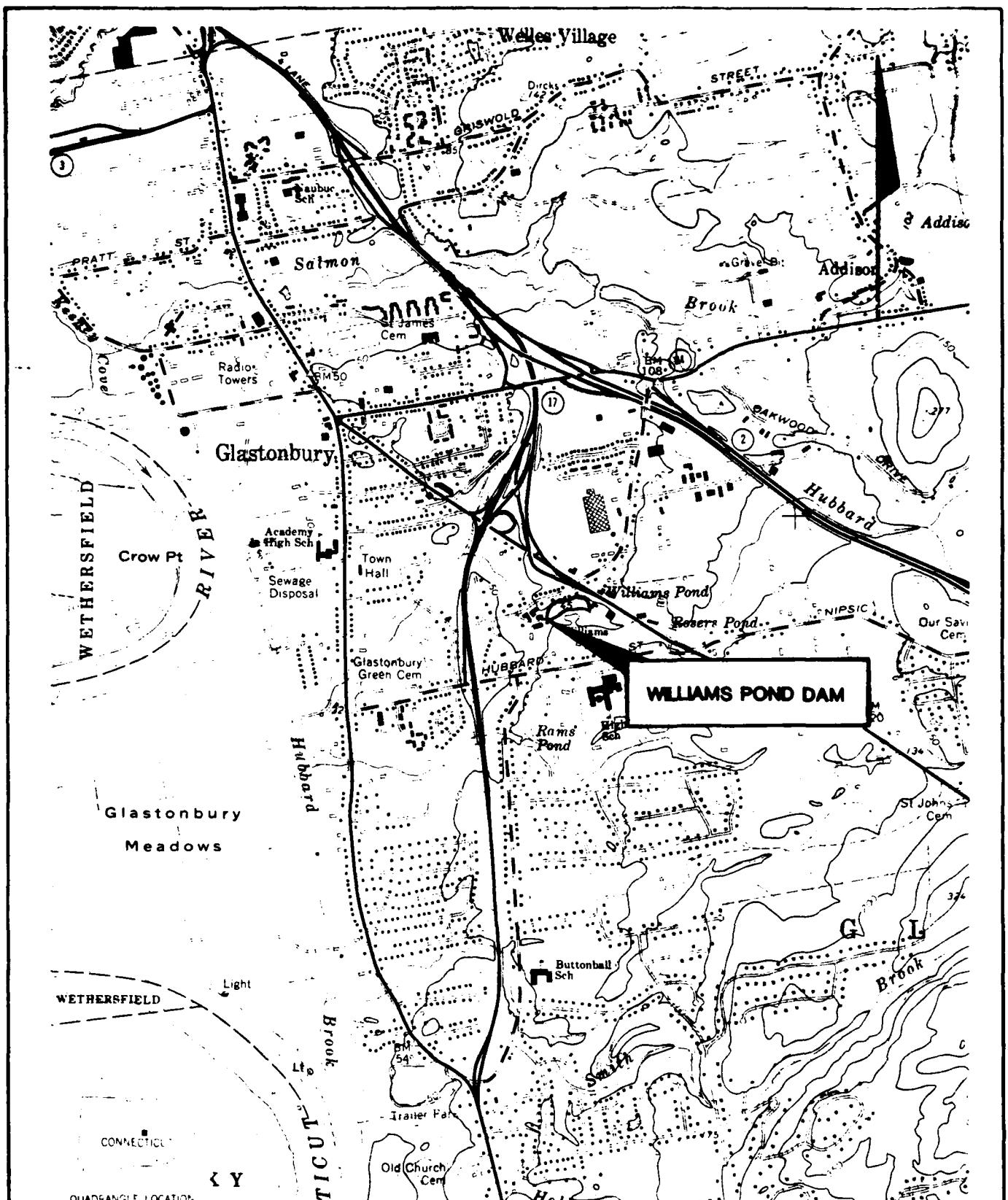
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WILLIAMS POND DAM



QUADRANGLE : GLASTONBURY, CT

U.S. ARMY, CORPS OF ENGINEERS
NEW ENGLAND DIVISION
WALTHAM, MASS

LOCATION MAP

SCALE IN FEET
2000 0 2000 4
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PHASE I INSPECTION REPORT
WILLIAMS POND DAM CT 00900

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority - Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Storch Engineers has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Storch Engineers under a letter of May 1, 1981 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0035 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection -

(1) Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

(2) Encourage and prepare the states to quickly initiate effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location - Williams Pond Dam is located in the Town of Glastonbury, Hartford County, Connecticut. The dam and pond are located just south of the

intersection of Williams Street East and the New London Turnpike. The coordinates of the dam are approximately $41^{\circ}42.3'$ north latitude and $72^{\circ}35.8'$ west longitude. The dam is located on Hubbard Brook in the Connecticut River Basin approximately 2.4 miles from the confluence with the Connecticut River.

b. Description of Dam and Appurtenances - Williams Pond Dam is comprised of stone masonry, concrete and earth embankment and is 17.1 feet high and approximately 190 feet long. A 2 foot high by 1.5 foot wide concrete wall runs the length of the dam. The bottom of this wall ranges from approximately 3.5 feet to 5 feet deep. The top of the dam is approximately 30 feet wide and is covered with well maintained grass. An earthen upstream face has a 2:1 slope and is completely underwater. The downstream face consists of a vertical stone masonry wall which has been surfaced with concrete in the vicinity of the main spillway.

The main spillway is located slightly closer to the southern side of the dam and is a weir 8 feet long. At this location, the entire downstream face of the dam is concrete on a 1:3 slope. Concrete spillway abutments rise 4 feet above the spillway and on the south spillway abutment there is a manually operated low-level discharge gate. This gate controls a 2'x2' opening through the base of the dam. Adjacent to the spillway is a wooden footbridge that allows passage from one side of the spillway to the other.

On the north side of the pond is an auxiliary spillway that is approximately 150 feet from the north end of the dam. The concrete weir is in the shape of a half-circle of radius 17 feet and it has an arclength of 53 feet. Below the spillway, the concrete slopes at approximately 1:2 for a vertical distance of 10 feet to the invert of an 84 inch reinforced concrete pipe that discharges into Hubbard Brook.

Three intake structures along the northern end of the dam which were once used for power supply and fire protection have since been completely sealed off on the upstream face.

c. Size Classification - Williams Pond Dam is 17.1 feet high and stores 25 acre-feet at the top of the dam. In accordance with the Recommended Guidelines for Safety Inspection of Dams established by the Corps of Engineers, the dam is classified as SMALL (height less than 40 feet, storage less than 1,000 acre-feet).

d. Hazard Classification - Williams Pond Dam is classified as having a HIGH hazard potential. Failure of the dam could result in the loss of more than a few lives and cause significant property damage. Immediately downstream from the dam, the flood wave would strike two apartment buildings. The first floor window sills of the apartments are approximately 7 feet above the streambed. Estimated flow and water depth at these locations just prior to dam failure is 180 cfs and 4 feet and just after dam failure is 3,090 cfs and 11.3 feet. Therefore, the water level would rise approximately 4.3 feet above the first floor window sills.

e. Ownership - Williams Pond Dam is owned by:

Adrian Goldman & Michael Stearn
The Soap Factory Apartments
222 Williams Street
Glastonbury, Connecticut 06033
(203) 659-1176

f. Operator - Operating personnel are under the direction of:

Mr. Joseph Gradowski, Property Manager
222 Williams Street
Glastonbury, Connecticut 06033

g. Purpose of Dam - The dam originally supplied power and provided fire protection to the J. B. Williams Company Soap Factory. The factory has subsequently been converted to apartments. Presently, the pond and dam are used for recreation purposes only.

h. Design and Construction History - Williams Pond Dam was constructed around 1900. No information is available on the original design or construction of the dam. Certain alterations were made to the dam in 1940 to protect the factory from flooding during heavy rains. An auxiliary spillway with an outlet conduit that bypasses the factory entirely was installed, the main spillway was narrowed and the spillway abutments were raised. Engineering drawings showing the alterations to the dam are included in Appendix B.

i. Normal Operational Procedures - There are no formal operational procedures for Williams Pond Dam. The low-level discharge gate can be hoisted using a portable hydraulic jack so that the pond can be lowered if necessary. The low-level discharge is inaccessible if the dam is overtopped.

1.3 Pertinent Data

a. Drainage Area - The Williams Pond drainage basin is located in the Town of Glastonbury, Connecticut and is irregular in shape. The area of the drainage basin is 1,420 acres or 2.2 square miles (Appendix D - Plate 5). Less than 5 percent of the drainage basin is natural storage and about 80 percent is undeveloped. The topography is rolling with elevations ranging from 535 above the National Geodetic Vertical Datum (NGVD) to 45.6 (NGVD) at the spillway crest.

b. Discharge at Damsite - There are no records available for discharge at the dam.

(1) Outlet works (conduit) size:	2'x2'
Invert elevation (NGVD):	36.5
Discharge Capacity at top of dam:	95 cfs
(2) Maximum known flood at damsite:	Unknown

		<u>MAIN</u>	<u>AUXILIARY</u>
(3)	Ungated spillway capacity at top of dam:	180 cfs	660 cfs
	Elevation (NGVD):	49.6	49.6
(4)	Ungated spillway capacity at test flood elevation:	240 cfs	720 cfs
	Elevation (NGVD):	51.1	51.1
(5)	Gated spillway capacity at normal pool elevation:	N/A	N/A
	Elevation (NGVD):	N/A	N/A
(6)	Gated spillway capacity at test flood elevation:	N/A	N/A
	Elevation (NGVD):	N/A	N/A
(7)	Total Spillway capacity at test flood elevation:	240	720 cfs
	Elevation (NGVD):	51.1	51.1
(8)	Total project discharge at top of dam:	960 cfs	
	Elevation (NGVD):	49.6	
(9)	Total project discharge at test flood elevation:	2,115 cfs	
	Elevation (NGVD):	51.1	
c.	Elevation (feet above NGVD)		
(1)	Streambed at toe of dam:	32.5	
(2)	Bottom of cutoff:	Unknown	
(3)	Maximum tailwater:	36.5	
(4)	Normal pool:	45.6	
(5)	Full flood control pool:		

(6)	Spillway crest (ungated):	45.6
(7)	Auxiliary spillway crest:	45.6
(8)	Design surcharge (original design):	Unknown
(9)	Top of dam:	49.6
(10)	Test flood surcharge:	51.1
d.	Reservoir (length in feet)	
(1)	Normal pool:	500
(2)	Flood control pool:	N/A
(3)	Spillway crest pool:	500
(4)	Top of dam:	700
(5)	Test flood pool:	925
e.	Storage (acre-feet)	
(1)	Normal pool:	7
(2)	Flood control pool:	N/A
(3)	Spillway crest pool:	7
(4)	Top of dam:	25
(5)	Test flood pool:	42
f.	Reservoir Surface (acres)	
(1)	Normal pool:	1.7
(2)	Flood control pool:	N/A
(3)	Spillway crest:	1.7
(4)	Test flood pool:	8.2
(5)	Top of dam:	7.2
g.	Dam	
(1)	Type:	Stone masonry, concrete and earth embankment

(2) Length:	190 feet	
(3) Height:	17.1 feet	
(4) Top width:	30 feet	
(5) Side slopes:	Vertical at downstream masonry, 1:3 at downstream concrete below spillway, 2:1 at upstream earth embankment	
(6) Zoning:	Unknown	
(7) Impervious core:	Unknown	
(8) Cutoff:	Unknown	
(9) Grout curtain:	Unknown	
(10) Other	N/A	
h. Diversion and Regulating Tunnel:	N/A	
i. Spillway	<u>MAIN</u>	<u>AUXILIARY</u>
(1) Type:	Concrete broad crested weir	same
(2) Length of weir:	8 feet	53 feet
(3) Crest elevation	45.6	45.6
(4) Gates:	N/A	N/A
(5) U/S channel:	None	None
(6) D/S channel:	Well defined channel with stone side-walls	84" pipe emptying into natural channel
(7) General:	N/A	N/A
j. Regulating Outlets		
(1) Invert elevation (NGVD):	36.5	
(2) Size:	2'x2'	

(3) Description: Square opening through dam

(4) Control Mechanism Manually operated gate

(5) Other: Gate operable

SECTION 2 - ENGINEERING DATA

2.1 Design Data

No original design computations or drawings are available for this dam. The most pertinent engineering drawings for the alterations to the dam made in 1940 are included in Appendix B. Other drawings and correspondence relating to these design alterations can be obtained through the State of Connecticut Department of Environmental Protection.

2.2 Construction Data

The dam was constructed around 1900. No original construction drawings or data are available. The most pertinent plans for the construction changes made to the dam in 1940 are included in Appendix B. Other plans, specifications and correspondence relating to these construction changes can be obtained at the Connecticut Department of Environmental Protection.

2.3 Operation Data

The dam at one time supplied industrial power and fire protection to the J. B. Williams Company Soap Factory. Presently, the dam is used for recreation purposes only. The low-level discharge gate is operable and a full description of the operating procedure is described in Section 3C. No operating records for this dam have been maintained.

2.4 Evaluation of Data

a. Availability - No original design, construction or operation data are available for this dam. Engineering drawings from the 1940 alterations to the dam and survey plans from a 1981 survey of the dam and pond were used in the preparation of this report.

b. Adequacy - The available information along with the visual inspection and hydraulic/hydrologic computations were adequate to assess the condition of the facility.

c. Validity - The conclusions and recommendations found in this report are based on the available information, the visual inspection and hydraulic/hydrologic computations.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General - A visual inspection was conducted on May 18, 1981 by members of the engineering staff of Storch Engineers. A copy of the visual inspection checklist is contained in Appendix A of this report. Selected photos of the dam are contained in Appendix C.

In general, the overall condition of the dam and its appurtenant structures is FAIR.

b. Dam - The dam is a stone masonry/concrete and earth embankment structure. A vertical stone masonry wall comprises the downstream face and in the vicinity of the spillway the masonry is covered with concrete on a 1:3 slope as shown in the Overview Photo. A stand of well maintained grass covers the top of the dam and a 2 foot high by 1.5 foot wide concrete wall runs along the length of the dam (Photo 1). The upstream earthen face is on a 2:1 slope and is completely underwater. Brush is growing at the top of the upstream face along the base of the concrete wall. (Photos 1 and 2).

The stone masonry on the downstream face in the vicinity of the spillway needs repointing (Overview Photo). Spalling is evident along the entire length of the concrete wall. There is a small rectangular opening (less than 1 square foot) through the base of the wall near the northern end of the dam (Plate 1). This will allow approximately 540 gpm of water to flow through the opening and onto the grass covered crest of the dam. (See computations Appendix D).

At the southern end of the dam where the wall ends and the drainage ditch outlets into the pond, the ground is approximately 1 foot lower than the top

of dam (Photo 3, Plate 1). There was a dike at this location at one time (Plate 3) that tied into an adjacent hill. The dike was removed during construction of the drainage ditch and the rehabilitation of the apartments. This low area would cause overtopping before the water reaches the top of dam elevation. There was no seepage passing through the dam.

c. Appurtenant Structures - The main spillway is an 8-foot long concrete weir which is in good condition. The concrete spillway abutments are in good condition, on their downstream face, immediately adjacent to the spillway where resurfacing has been done but are spalled elsewhere (Photo 2). On the downstream face below the spillway, the concrete is in good condition. The 53-foot long semicircular auxiliary spillway on the north side of the pond is heavily overgrown with vines (Photo 9). Spalling of the concrete weir was evident although the extent of the spalling was obscured due to the overgrowth. The 84-inch conduit is in good condition although spalling and exposed reinforcement occur at its outlet into Hubbard Brook (Photo 10). A short section of reinforced concrete retaining wall along the bank of this outlet stream is severely cracked and is falling into the stream (Photo 10).

There is a low-level discharge mechanism at the south side of the spillway that controls a 2'x2' conduit that passes through the base of the dam (Photos 5 and 6). The gate consists of a 3/8 inch thick steel plate which slides along vertical tracks. To operate the gate requires a portable hydraulic jack which is available at the site. The jack lifts a steel cable (Photo 5) which is attached to the plate (Photos 1 and 2). It takes only a few minutes to set up the jack and emptying the pond takes about 4 hours. Operation while the dam is being overtopped would be difficult as

someone must stand on the spillway abutment to operate the jack. Adjacent to the spillway is a wooden footbridge supported by steel beams to allow passage to either side of the spillway (Photo 1). The footbridge is structurally stable.

There are three intake structures on the northern side of the dam (Photo 4, Plate 3). One structure controls two 10 inch fire protection conduits and each of two other structures controls a 30 inch power conduit. All the pipes are no longer used and have been sealed at the upstream side.

d. Reservoir Area - The area immediately adjacent to the pond is gently sloped and in a natural state. The shoreline shows no signs of sloughing or erosion. A rise in the water level of the pond will not endanger life or property, except at the south abutment where water can prematurely flow over a low section of the dam and flood some apartments (Photo 3).

e. Downstream Channel - The downstream channel runs under a concrete patio for a distance of 150 feet where it emerges as a 3 foot high by 7 foot wide channel with stone masonry side walls (Plate 1, Photo 8). The entrance where it passes under the patio is approximately 25 feet from the dam and is cluttered with debris (Photo 7). The channel winds around an apartment complex and passes under numerous walkways and footbridges along its route.

3.2 Evaluation

Overall, the general condition of the dam is FAIR. The visual inspection revealed items that led to this assessment, such as:

- a. Missing mortar in the downstream masonry face;
- b. Spalling of the concrete wall along the top of dam;

- c. Brush growing along the upstream face of the concrete wall;
- d. A rectangular opening in the concrete wall that could cause some erosion on the grass covered crest of the dam.
- e. A low area at the southern end of the dam that would cause premature overtopping of the dam;
- f. Debris in the downstream channel;
- g. Overgrowth and spalling on the auxiliary spillway;
- h. A collapsing retaining wall at the outlet to the auxiliary spillway conduit.
- i. Inadequate means of raising the low-level discharge gate.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General - At one time the dam supplied power and fire protection to the J. B. Williams Company Soap Factory. Presently, the dam is used for recreation purposes only. The water level can be controlled by a low-level discharge gate which can be operated by using a hydraulic jack as described in Section 3.

b. Description of Any Warning System in Effect - There is no formal warning system in effect for this dam.

4.2 Maintenance Procedures

a. General - There is no specific maintenance program for this dam.

b. Operating Facilities - The low-level discharge is operable. The power and fire protection conduits are sealed off at the intake structures.

4.3 Evaluation

There is no regularly scheduled maintenance program. A systematic and complete maintenance program should be instituted at the dam and a formal warning system should be developed.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Williams Pond Dam is a stone masonry/concrete and earth embankment dam that is 17.1 feet high and approximately 190 feet long. The main spillway is 8 feet long and is located slightly closer to the south side of the dam. There is a manually operated low-level discharge gate on the south spillway abutment. On the north side of the pond is an auxiliary spillway in the shape of a half-circle of radius 17 feet. The weir has an arclength of 53 feet and a width of 3 feet and the drop is 8.5 feet to the invert of an 84 inch reinforced concrete pipe.

The watershed encompasses 2.2 square miles and is approximately 80 percent undeveloped. Rolling topography is characteristic of the region with terrain rising to 489 feet from the spillway crest.

The pond has a total capacity of approximately 7 acre-feet at the spillway crest and approximately 25 acre-feet when the pond is at the top of the dam.

5.2 Design Data

No design data are available for the original dam, however, engineering drawings for alterations made to the dam in 1940 are included in Appendix B.

5.3 Experience Data

No historical data for recorded discharges or water elevations are available for this dam, however, the dam has withstood past major floods such as; March 1936 and September 1938 as well as January and February 1978 and January 1979. The flood of record in the Glastonbury area resulted from the storm of September, 1938.

5.4 Test Flood Analysis

Based on the Recommended Guidelines for Safety Inspection of Dams, the dam is classified as a SMALL structure with a HIGH hazard potential. The test flood for these conditions ranges from 1/2 the probable maximum flood (PMF) to the PMF. One half of the PMF was used for this dam because of the dam's small size.

Using guide curves established by the Corps of Engineers (rolling terrain), the test flood inflow is 2,110 cfs. The routing procedure established by the Corps' guidelines gives an approximate outflow of 2,030 cfs. The combined spillway capacity of the dam is approximately 840 cfs or 41 percent of the routed test flood outflow. The test flood would overtop the dam by 1.5 feet.

Approximately 2,000 feet upstream from Williams Pond Dam is Rosers Pond Dam which controls flow into Williams Pond Dam. In the development of the test flood inflow, it was assumed that the peak outflow from Rosers Pond Dam and the peak runoff from the independent watershed occurred at the same time. Storage behind the dam was assumed to begin at the elevation of the spillway crest. Storage was determined by an average area depth analysis. Capacity curves for the spillways assumed a broad crested weir.

5.5 Dam Failure Analysis

A dam failure analysis was performed using the Rule of Thumb method in accordance with guidelines established by the Corps of Engineers. The breach width was taken as 40 percent of the dam length at midheight which calculated to be 32 feet. Failure was assumed to occur when the water level in the pond was at the top of the dam.

The main spillway discharge just prior to dam failure is 180 cfs and the calculated dam failure discharge is 3,805 cfs.

Failure of Williams Pond Dam could result in the loss of more than a few lives and cause significant property damage which gives this dam a HIGH hazard potential classification. Immediately downstream of the dam is an apartment complex with first floor window sills approximately 7 feet above the streambed. Estimated flow and water depths at this location just prior to dam failure is 180 cfs and 4 feet respectively and just after dam failure is 3,090 cfs and 11.3 feet. Therefore, the water level would rise approximately 4.3 feet above the first floor window sills of the apartments which would result in significant flooding to the 24-first floor apartments in the two apartment buildings that would be affected at the site.

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The general structural stability of the dam is good as evidenced by the vertical, horizontal and lateral alignment. The earth embankment portions of the dam also show no evidence of instability. Spalling is evident on the 2-foot high concrete wall along the top of the dam and the stone masonry on the downstream face needs repointing. The auxiliary spillway structure is stable although the weir is spalled substantially.

6.2 Design and Construction Data

The dam was constructed around 1900. No original design or construction information is available.

6.3 Post-Construction Changes

Certain alterations were made to the dam in 1940 to protect the factory from flooding during heavy rains. An auxiliary spillway was added, the main spillway was narrowed and the spillway abutments were raised. The engineering drawings showing the most pertinent of these alterations are included in Appendix B. It is assumed that the low area at the south end of the dam was a result of the dike being cut down during construction of the drainage ditch and rehabilitation of the apartments.

6.4 Seismic Stability

The dam is located in Seismic Zone 1 and in accordance with Recommended Phase 1 Guidelines does not warrant a seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition - After consideration of the available information, the results of the inspection, contact with the owner and hydraulic/hydrologic computations, the general condition of the Williams Pond Dam is FAIR.

b. Adequacy of Information - The information available is such that the assessment of the safety of the dam was based on the available information, the visual inspection results and computations developed for this report.

c. Urgency - It is considered that the recommendations and remedial measures suggested below should be implemented by the Owner within one year after receipt of this Phase I Inspection Report.

7.2 Recommendations

It is recommended that the Owner employ a qualified registered engineer to:

a. Design a solution to and oversee the reconstruction of the low area at the south end of the dam such as an earth dike or an extension of the concrete wall.

b. Prepare a detailed hydraulic/hydrologic investigation to assess further the potential of overtopping and the need for and the means to increase the project discharge capacity.

c. Design and rebuild the concrete retaining wall at the outlet of the auxiliary spillway conduit.

d. Improve access to and means of raising and lowering the low-level discharge gate.

7.3 Remedial Measures

a. Operation and Maintenance Procedures -

- (1) Repoint the stone masonry in the downstream face of the dam.
- (2) Repair the spalling at the abutments of the principal spillway and along the concrete wall and fill the rectangular opening with concrete.
- (3) Remove the overgrowth from the auxiliary spillway and repair the spalled concrete weir.
- (4) Remove the brush growing along the upstream side of the concrete wall along the top of the dam.
- (5) Clear the debris from the downstream channel where it passes underneath the patio.
- (6) Institute a program of annual technical inspection by a qualified engineer.
- (7) Develop plans for around-the-clock surveillance for periods of unusually heavy rains and institute a formal downstream warning system for use in the event of an emergency.

7.4 Alternatives

There are no practical alternatives to the above recommendations.

APPENDIX A
INSPECTION CHECK LIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Williams Pond DamDATE 5/18/81TIME 11:00 a.m.WEATHER Sunny, 60'sW.S. ELEV. U.S. DN.S. PARTY:

1. Gary Giroux, S.E. Hydr./Struct. 6. _____
2. Benjamin Cohen, S.E. Civil 7. _____
3. Ross Huntington, S.E. Mechanical 8. _____
4. David Steben, S.E. Technician 9. _____
5. 10. _____

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Dam Embankment</u>	B. Cohen G. Giroux	Good
2. <u>Mechanical</u>	R. Huntington D. Steben	Fair
3. <u>Spillway</u>	G. Giroux B. Cohen	Good
4. <u>Discharge Channel</u>	R. Huntington B. Cohen	Fair
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

INSPECTION CHECK LIST

PROJECT Williams Pond DamDATE 5/18/81

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	49.6 (NGVD)
Current Pool Elevation	45.6 (NGVD)
Maximum Impoundment to Date	Unknown
Surface Cracks	None
Pavement Condition	N/A
Movement or Settlement of Crest	None
Lateral Movement	None
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Dike at north abutment has been removed, concrete wall along crest is spalled
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	Some
Vegetation on Slopes	Brush on upstream side
Sloughing or Erosion of Slopes or Abutments	None
Rock Slope Protection - Riprap Failures	N/A
Unusual Movement or Cracking at or near Toes	None
Unusual Embankment or Downstream Seepage	None
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

INSPECTION CHECK LIST

PROJECT Williams Pond DamDATE 5/18/81

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>CUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u></p> <p>a. Approach Channel</p> <p>Slope Conditions</p> <p>Bottom Conditions</p> <p>Rock Slides or Falls</p> <p>Log Boom</p> <p>Debris</p> <p>Condition of Concrete Lining</p> <p>Drains or Weep Holes</p> <p>b. Intake Structure</p> <p>Condition of Concrete</p> <p>Stop Logs and Slots</p>	<p>Intake structures for power generation and fire protection are sealed off with concrete. Intake structure for low level discharge is underwater</p>

INSPECTION CHECK LIST

PROJECT Williams Pond DamDATE 5/18/81PROJECT FEATURE NAME DISCIPLINE NAME

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u>	
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System in Gate Chamber	Low level discharge gate requires portable hydraulic hoist to open

INSPECTION CHECK LIST

PROJECT Williams Pond DamDATE 5/18/81

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u> General Condition of Concrete Rust or Staining on Concrete Spalling Erosion or Cavitation Cracking Alignment of Monoliths Alignment of Joints Numbering of Monoliths	N/A

INSPECTION CHECK LIST

PROJECT Williams Pond Dam

DATE 5/18/81

PROJECT FEATURE

NAME

DISCIPLINE

145

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND</u>	
<u>OUTLET CHANNEL</u>	
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	
Channel	Low-level discharge outlets into
Loose Rock or Trees Overhanging	spillway channel
Channel	
Condition of Discharge Channel	

INSPECTION CHECK LIST

PROJECT Williams Pond DamDATE 5/18/81

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION	
	MAIN SPILLWAY	AUXILIARY SPILLWAY
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>		
a. Approach Channel	Underwater	Underwater
General Condition		
Loose Rock Overhanging Channel		
Trees Overhanging Channel		
Floor of Approach Channel		
b. Weir and Training Walls		
General Condition of Concrete	Good	Fair overgrown w/vines
Rust or Staining	None	Some
Spalling	None	Some
Any Visible Reinforcing	None	None visible, weir obscured by vines
Any Seepage or Efflorescence	None	None
Drain Holes	None	None
c. Discharge Channel		<u>At 84" RCP outlet</u>
General Condition	Good	Fair
Loose Rock Overhanging Channel	None	Concrete wall tipping into channel
Trees Overhanging Channel	Few	Some
Floor of Channel	Some loose stones and debris	Some loose stones and debris
Other Obstructions	Several pedestrian bridges	
	18" building column in center of channel	

INSPECTION CHECK LIST

PROJECT Williams Pond DamDATE 5/18/81

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u>	N/A
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

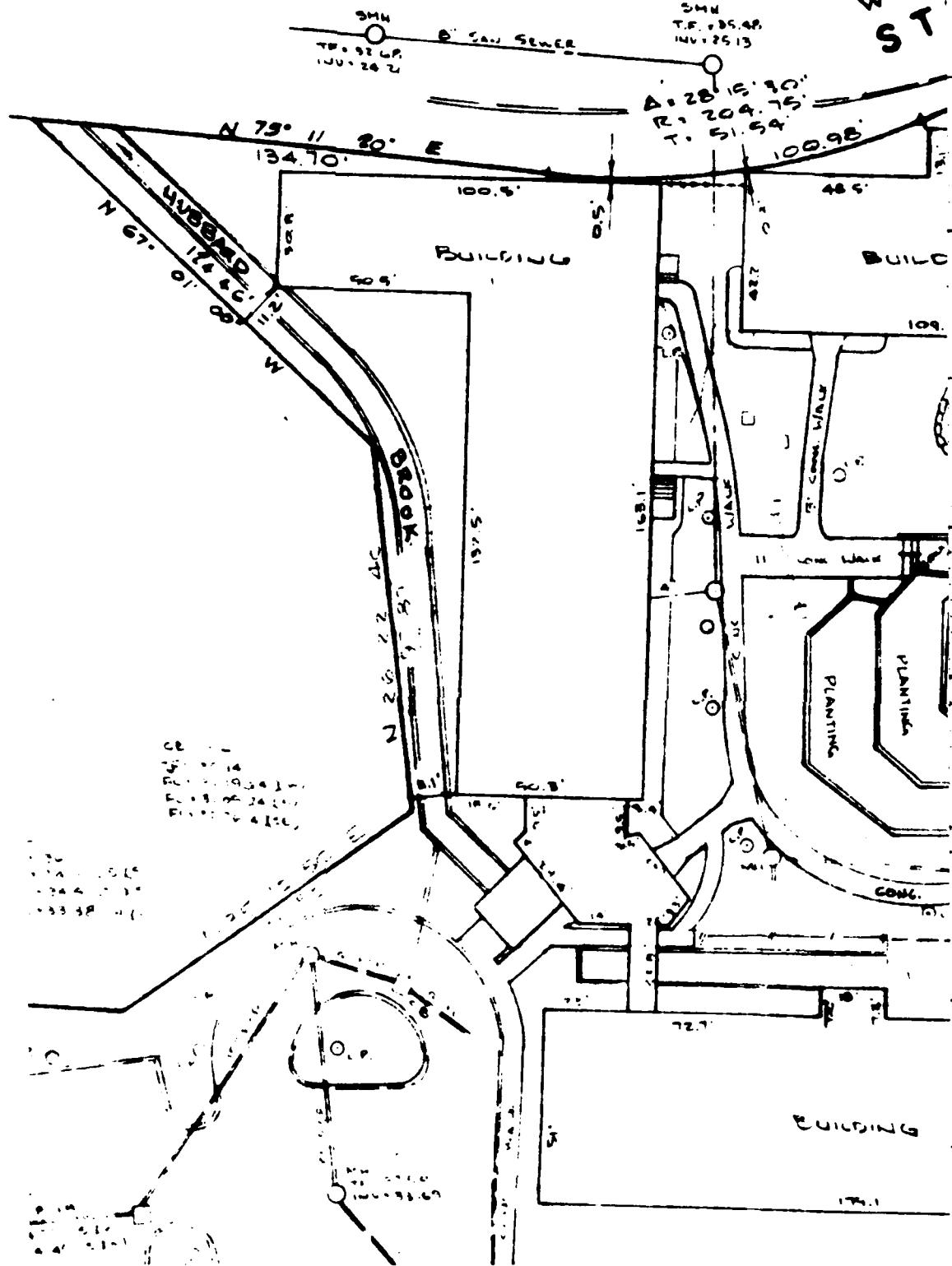
APPENDIX B
ENGINEERING DATA

Any information pertaining to the history of the dam is located
at:

State of Connecticut
Department of Environmental
Protection
Water Resources Unit
State Office Building
Hartford, Connecticut 06115

W. 44-5 T.
49 E.

WILL
ST



6

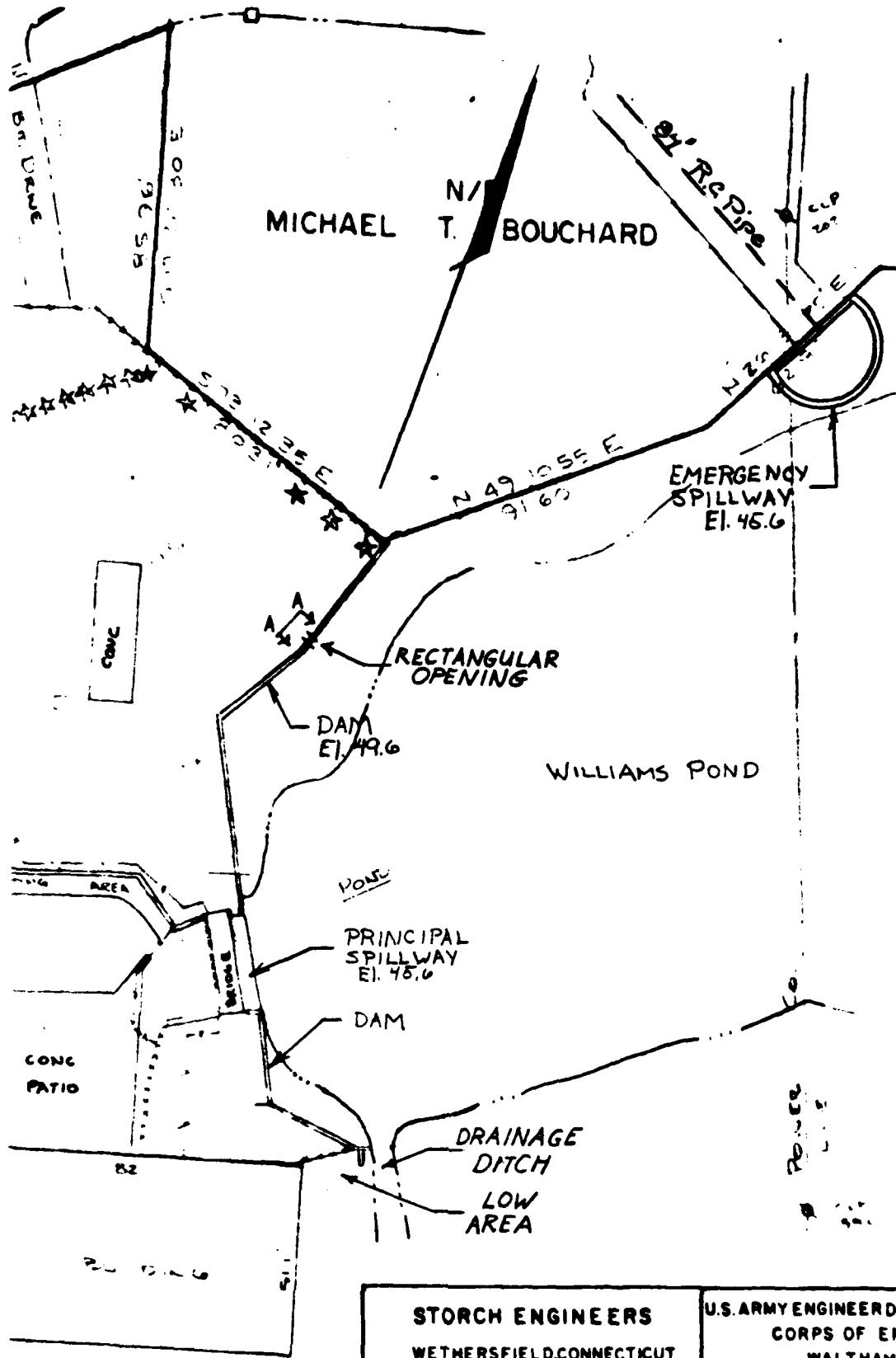


PLATE 1

STORCH ENGINEERS
WETHERSFIELD, CONNECTICUT

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM MASS.

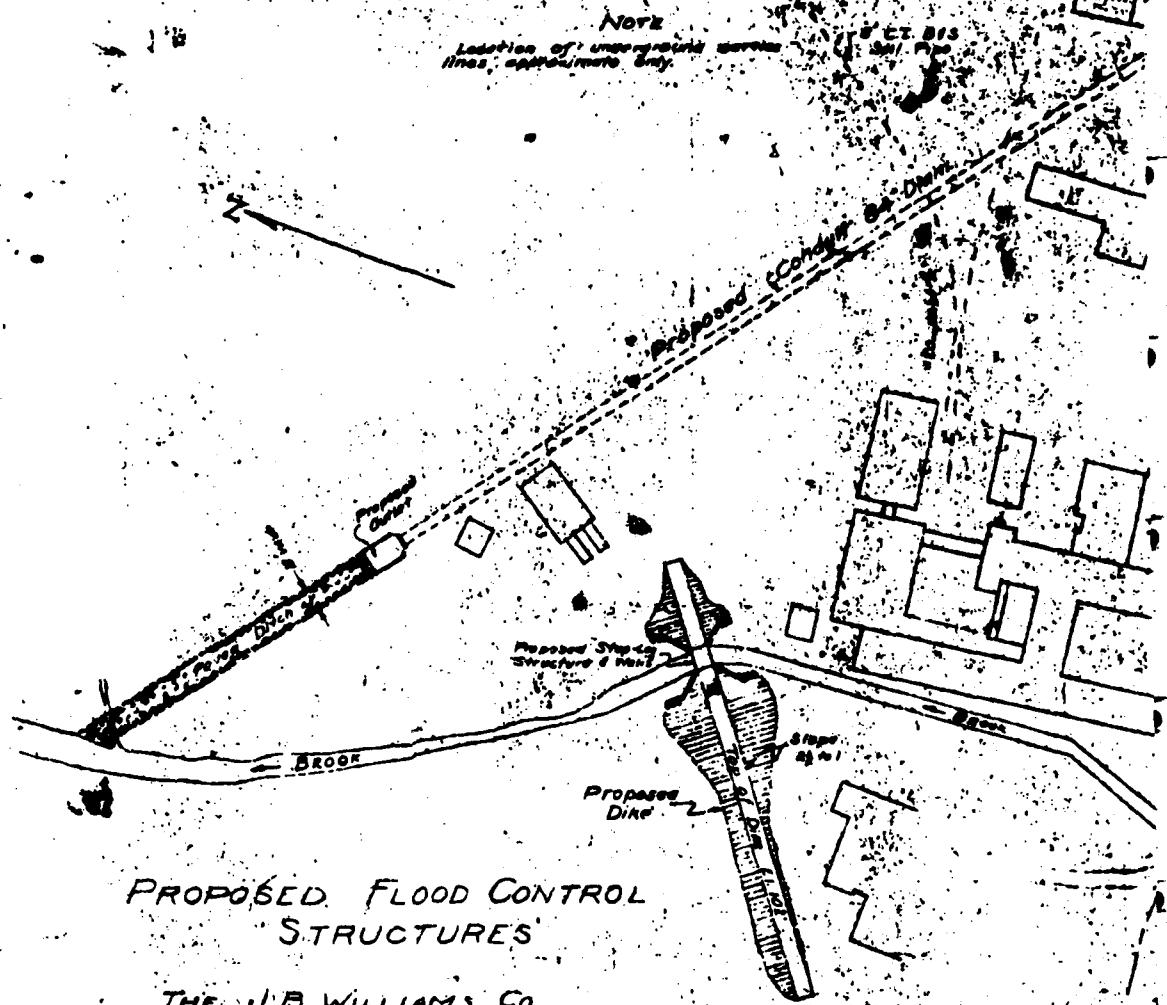
NATIONAL PROGRAM OF INSPECTION OF NON-FED.DAMS

WILLIAMS POND DAM

3

SCALE AS SHOWN
DATE 7/31/81

NOT TO SCALE



PROPOSED FLOOD CONTROL STRUCTURES

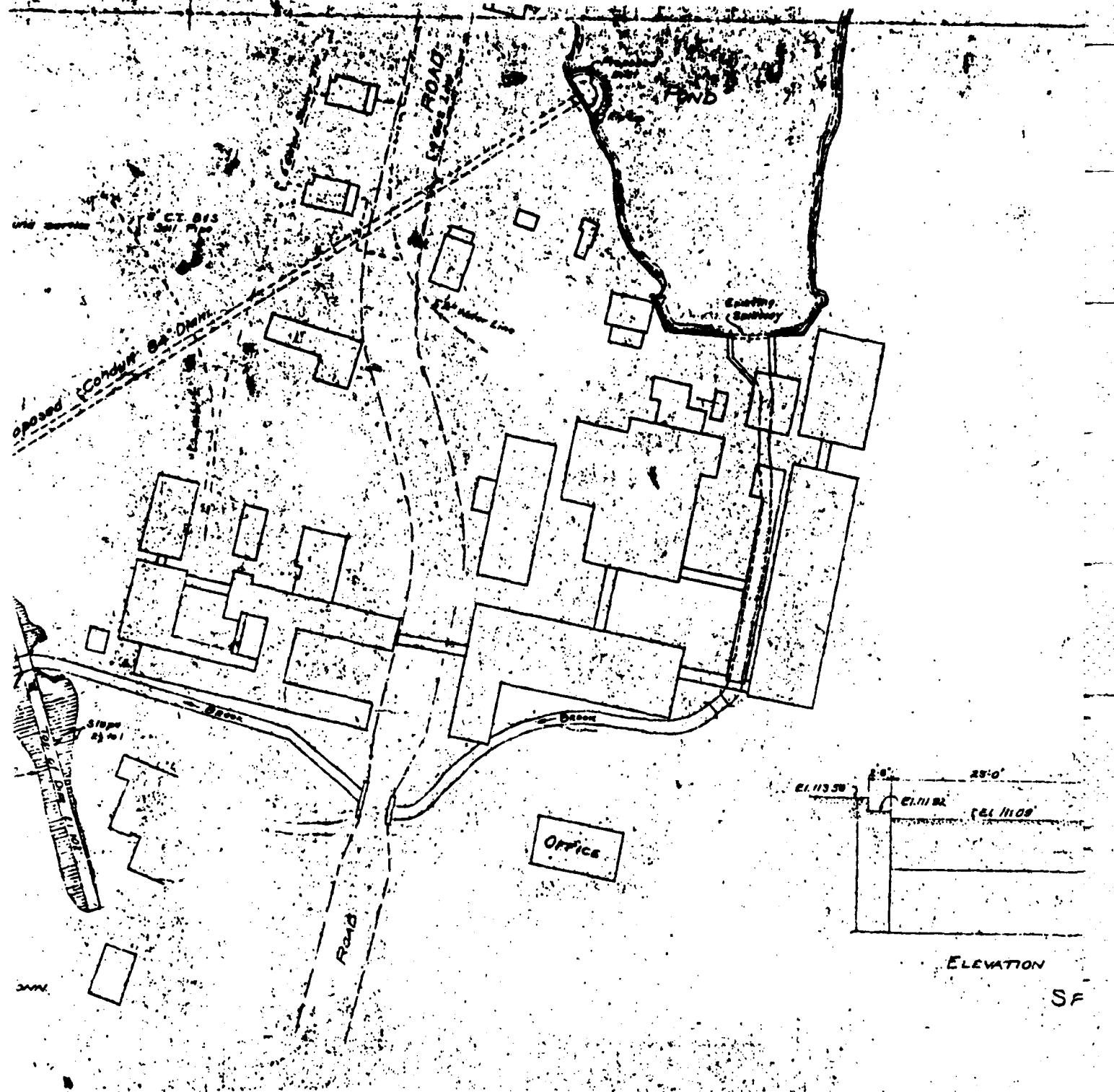
THE J.B. WILLIAMS CO.
GLASTONBURY, CONN.

BENNETT & TERRY, ENGRS.
36 PEARL ST

Oct. 3, 1939
HARTFORD, Conn.

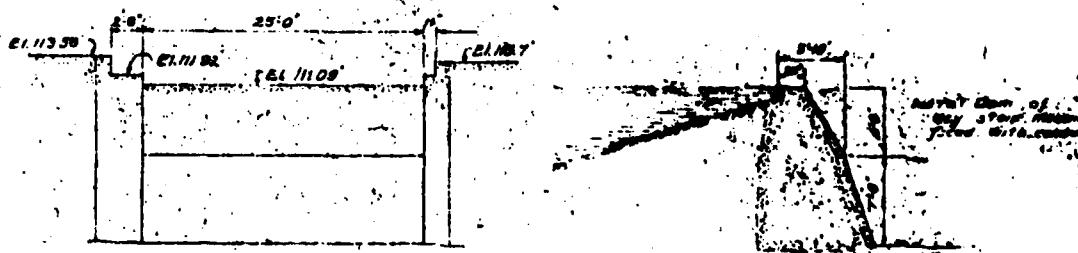
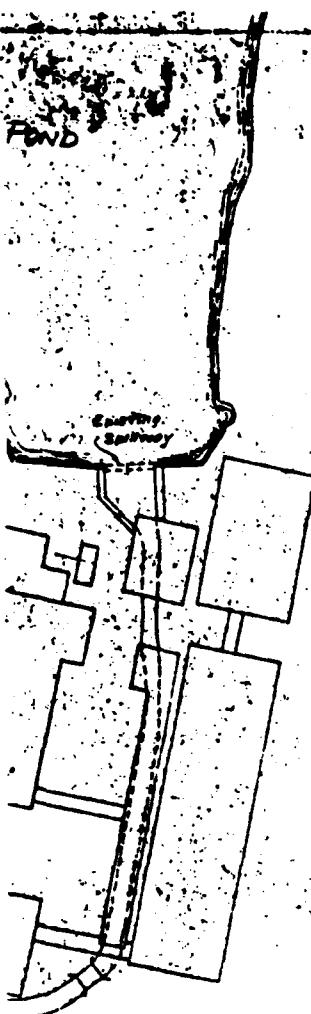
LOCATION PLAN DWG. NO. 1
SCALE 1-50

BENNETT & TERRY, EN
16 PEARL ST



STORCH
WETHERSF
NATIONAL

PHOTO REDUCED TO 1/2 SIZE



EL 113.50

25' 0"

EL 114.50

EL 114.00

10' 0"

EL 114.50

10' 0"

EL 114.50

SECTION

SPILLWAY DETAILS

SCALE 1/8"

J. B. WILLIAMS CO.

PLATE 2

STORCH ENGINEERS
WETHERSFIELD, CONNECTICUT

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM MASS

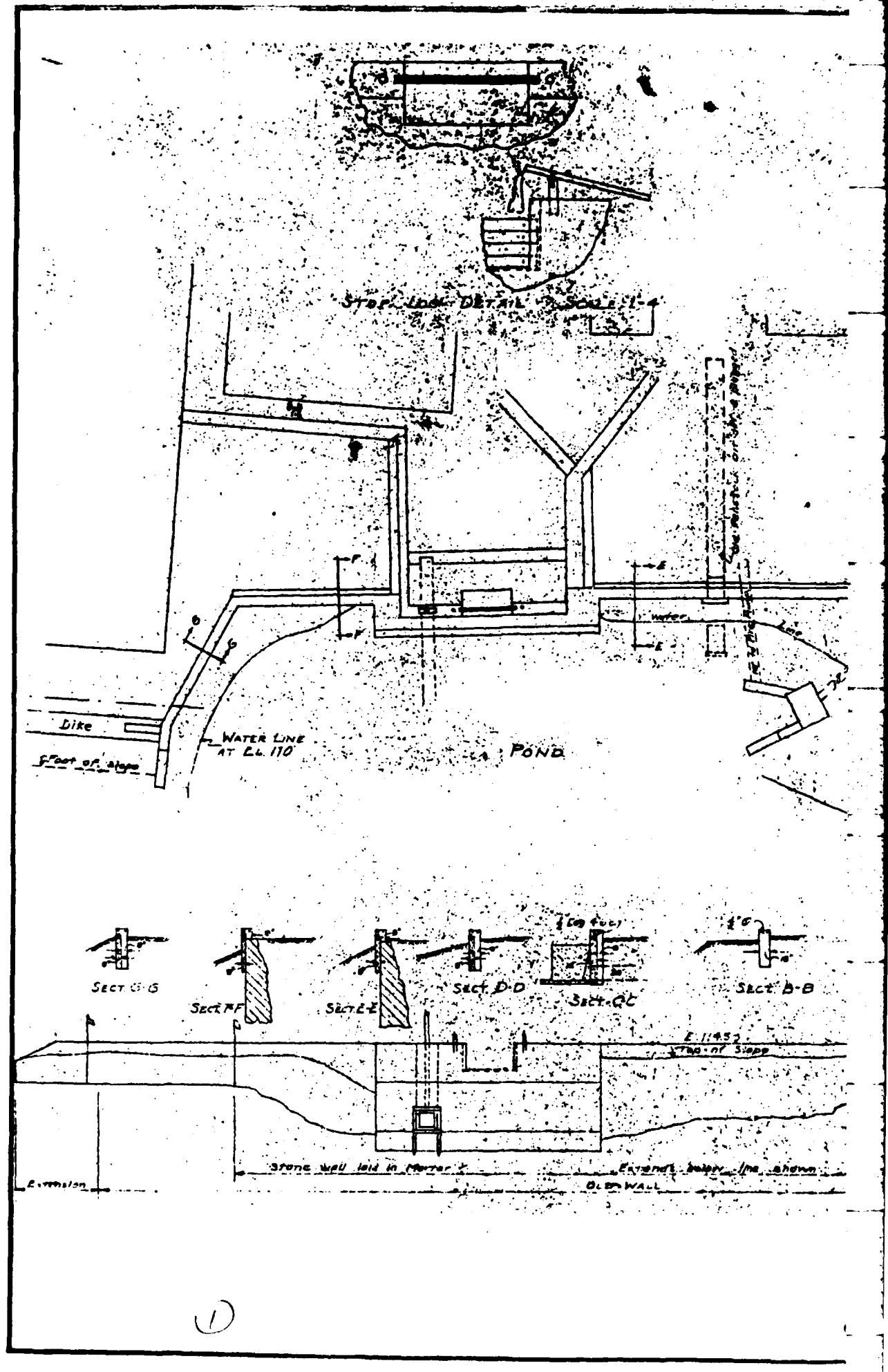
NATIONAL PROGRAM OF INSPECTION OF NON-FED.DAMS

WILLIAMS POND DAM

3
CED TO 1/2 SIZE

SCALE AS SHOWN

DATE 7/31/81





SECTION 1148 - SCALE 1:1

J.B. WILLIAMS CO.
GLASTONBURY, CT.

ALTERATIONS OF DAM & WINS WALLS

BENNETT & TIGER, INC.

190 PEAK ST.

SCALE 1:10

MAILED
AUG 12

NOTES

All new concrete. 1:2½:4
Original stone masonry.

Concre added at corners. 1/3 thick, before or
New work.

SECT. B-B SECT. A-A

E 11482

100 FT 3000

Existing dam line shown
Old wall

Exterior of 1148

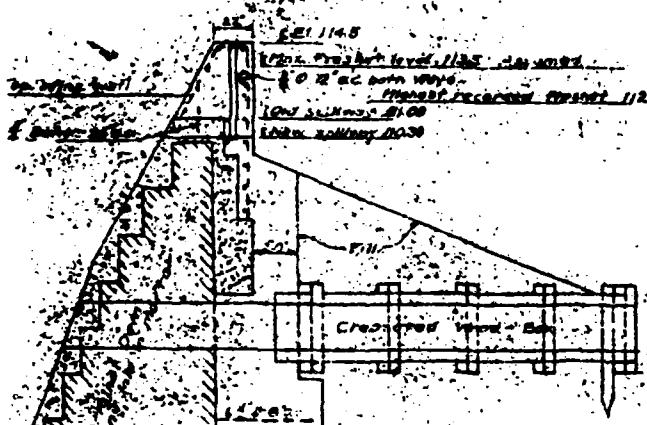
STORCH ENGIN
WETHERSFIELD, CT

NATIONAL PROG

3

PHOTO REDUCED TO 1/2 SIZE

3



SECTION 3 THRU DAM. SCALE 1:4

J.B. WILLIAMS CO.

GLASTONBURY, Ct.

ALTERATIONS OF DAM & WINS WALLS

BENNETT & TEECHING,
178 PEAK ST.

Scale 1:10

HARTFORD, CONN.
AUG 16, 1940

NOTES

All new concrete - 1:2:4
Original stone madney:
Concrete added to stones 10 times before this was done
New work

NOTES

- All new concrete 1:2:4
- Original & stone
- Concrete added stone
- New work

PLATE 3

STORCH ENGINEERS
WETHERSFIELD, CONNECTICUT

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED.DAMS

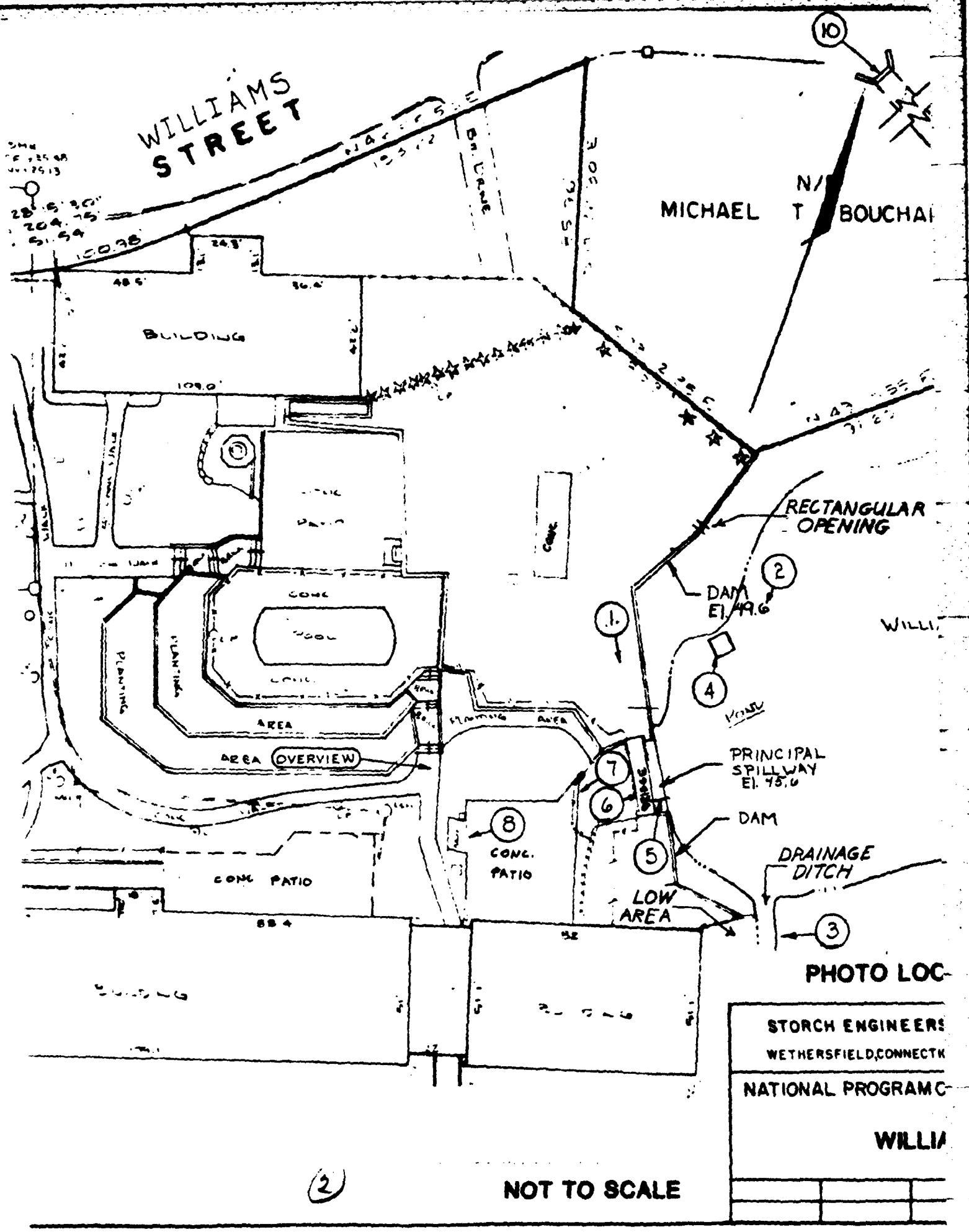
WILLIAMS POND DAM

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REDUCED TO 1/2 SIZE

SCALE AS SHOWN
DATE 7/31/81

APPENDIX C
PHOTOGRAPHS



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NOT TO SCALE

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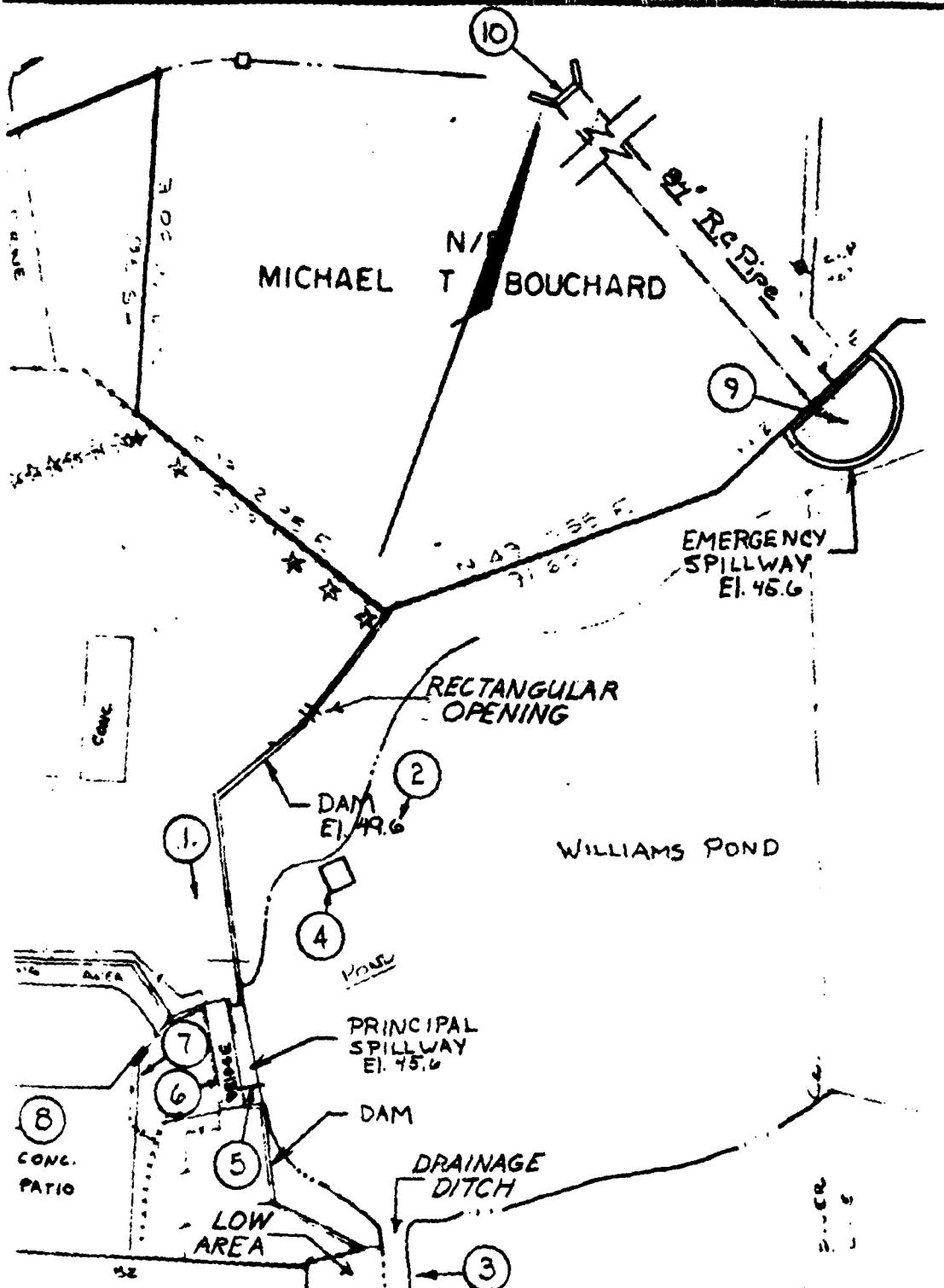


PHOTO LOCATION PLAN

PLATE 4

STORCH ENGINEERS
WETHERSFIELD, CONNECTICUT

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED.DAMS

WILLIAMS POND DAM

NOT TO SCALE

SCALE AS SHOWN
DATE 7/21/61



PHOTO 1
CREST OF DAM



PHOTO 2
UPSTREAM FACE OF DAM



PHOTO 3
DRAINAGE DITCH - SOUTH ABUTMENT

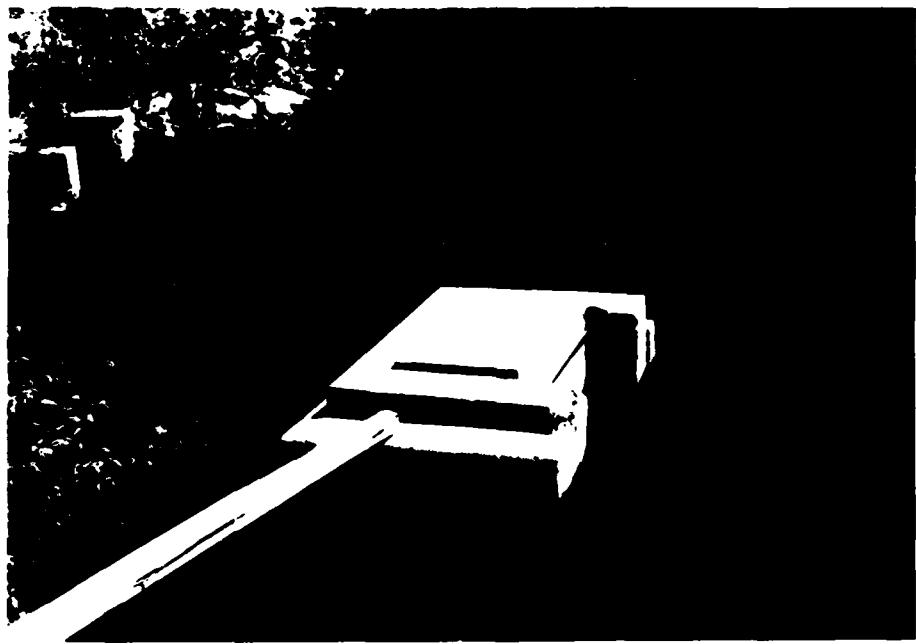


PHOTO 4
INTAKE STRUCTURES



PHOTO 6

LOW LEVEL DISCHARGE



PHOTO 5

LOW LEVEL DISCHARGE - CONTROL

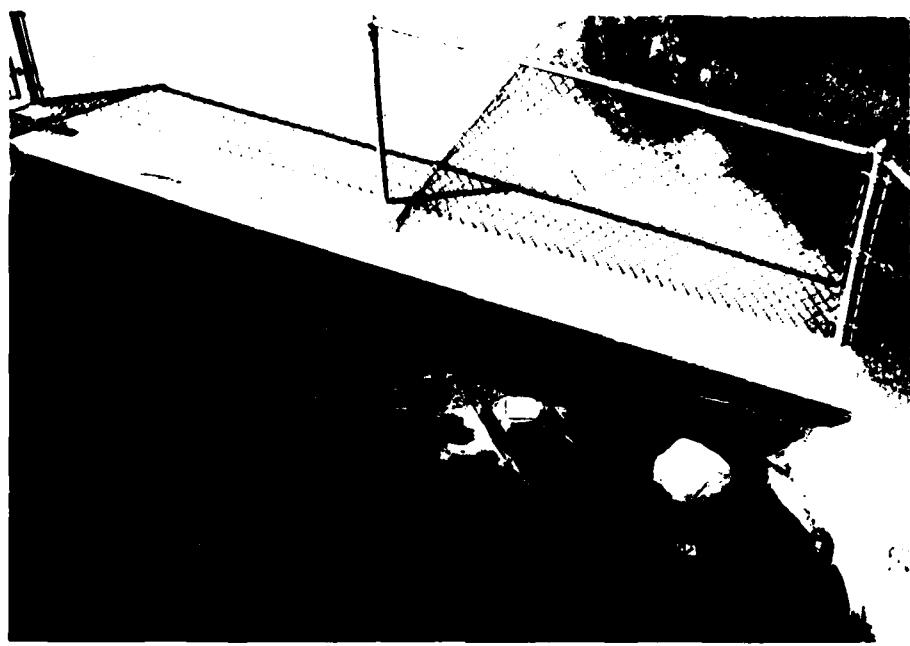


PHOTO 7
DOWNSTREAM CHANNEL



PHOTO 8
DOWNSTREAM CHANNEL

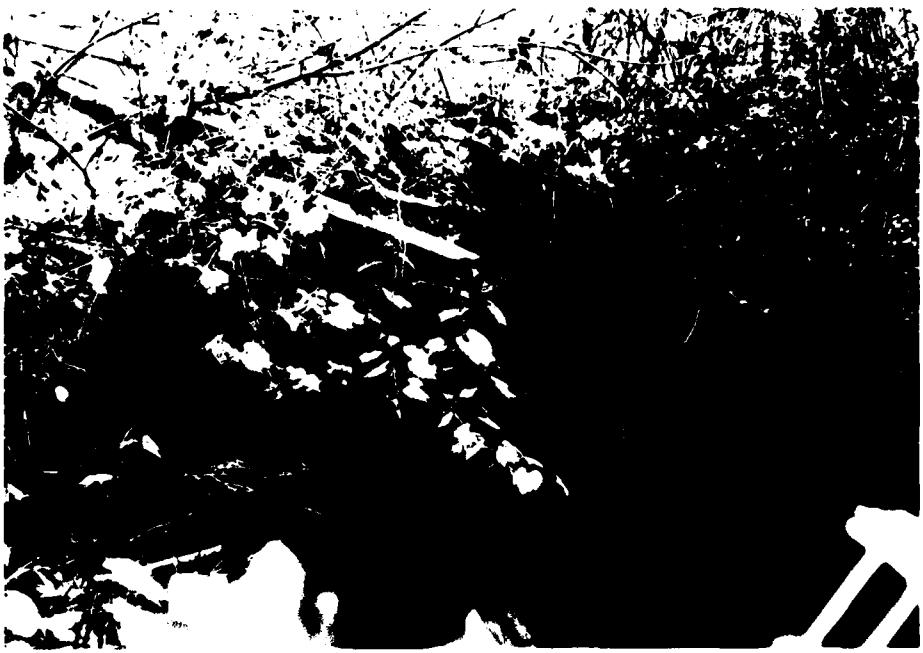
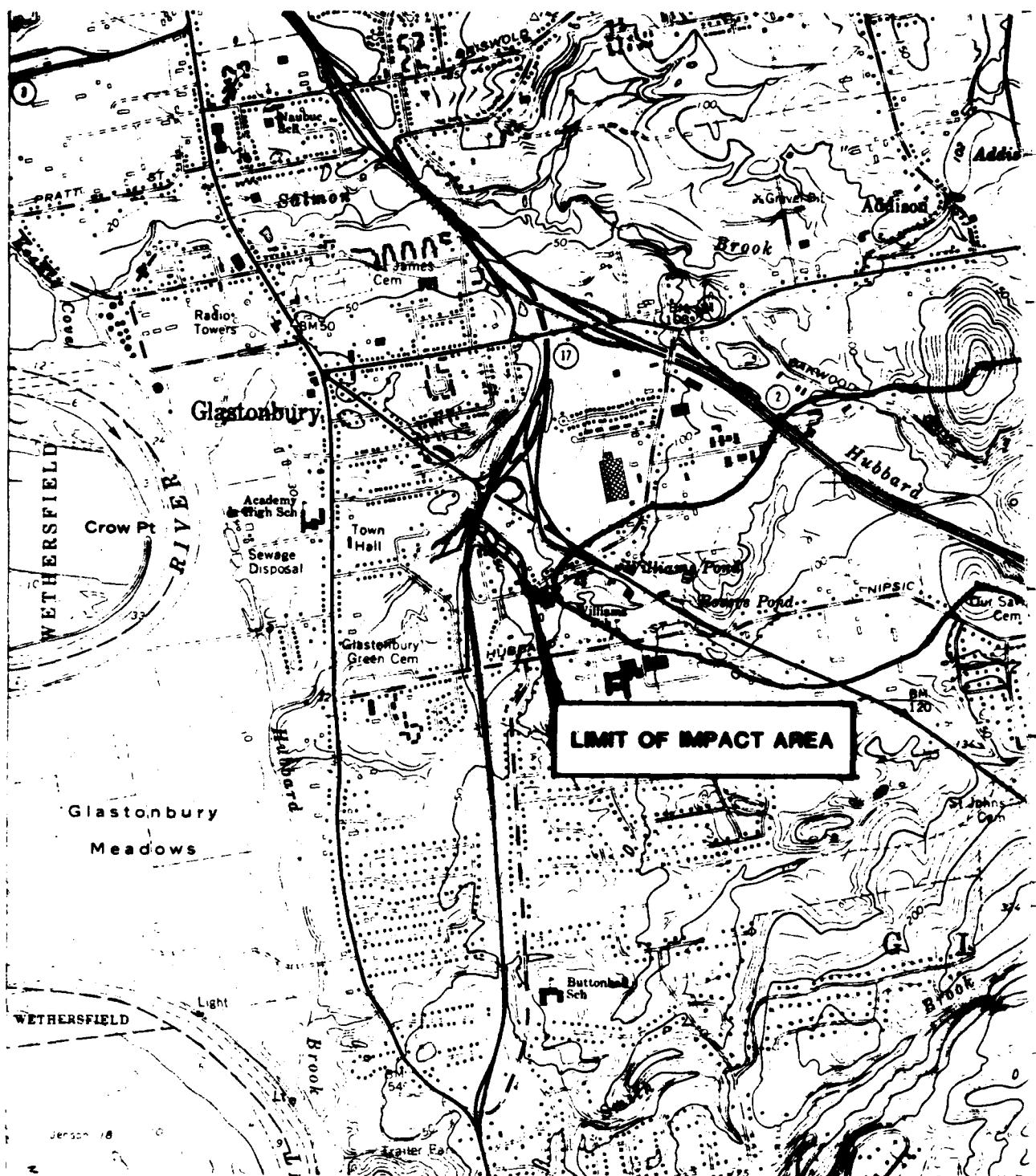


PHOTO 9
EMERGENCY SPILLWAY



PHOTO 10
OUTLET - EMERGENCY SPILLWAY

APPENDIX D
HYDRAULIC AND HYDROLOGIC COMPUTATIONS



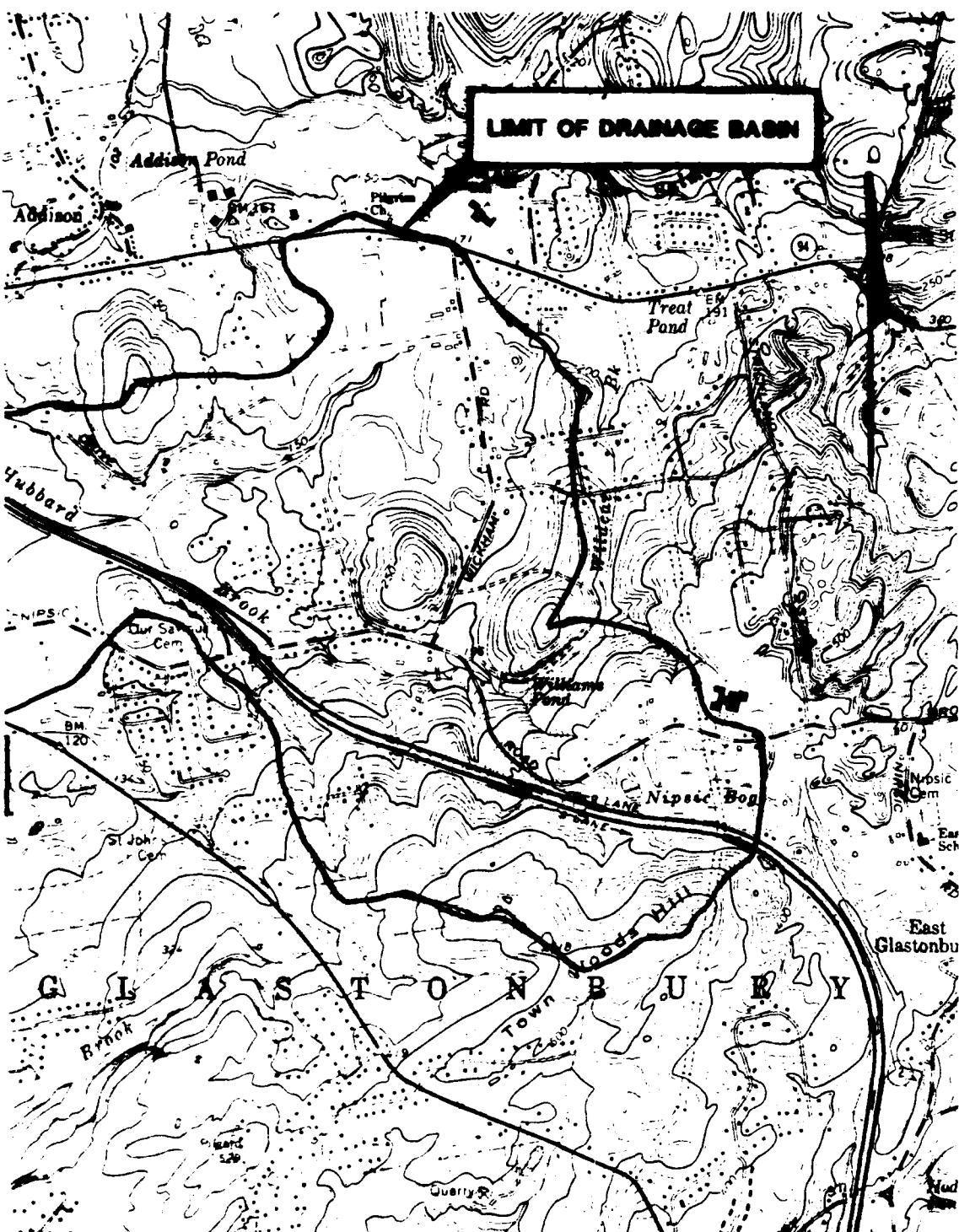


PLATE 5

STORCH ENGINEERS
WETHERSFIELD, CONNECTICUT

U.S. ARMY ENGINEER DIV NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED.DAMS

WILLIAMS POND DAM

1:24000

SCALE AS SHOWN

DATE 7/31/81

STORCH ENGINEERS
 Engineers - Landscape Architects
 Planners - Environmental Consultants

JOB Phase I Dam Inspection - #4463

SHEET NO. _____ OF _____
 CALCULATED BY GDC DATE 5/28/81
 CHECKED BY GJS DATE 5/29/81

Determination of Test Flood

NAME OF DAM Rocks 2nd Dam*

DRAINAGE AREA 2.1 SM

INFLOW Size:

Hazard:

Test Flood: 1/2 P-1 =

$$\text{Inflow} = 2100/2 = 1050 \text{ cfs/SM}.$$

$$Q = 1050 \times 1 = 210$$

Estimating the effect of surcharge storage on the Maximum Test Flood

1. $Q_{P1} = 210 \text{ cfs}$

2a. $H_1 = 5.6'$ (elev.)

b. $\text{STOR}_1 = 0.92''$

c. $Q_{P2} = Q_{P1} (1 - \text{STOR}_1/9.5) = 2000 \text{ cfs}$

3a. $H_2 = 5.3 \text{ STOR}_2 = 0.84''$

b. $\text{STOR}_A = 0.28''$

$Q_{PA} = 2005 \text{ cfs}$

$H_A = 5.3 \text{ STOR}_A = 0.84''$

Test Flood = 2105 cfs

Capacity of the spillway when the pond elevation is at the top of the dam

$Q = \text{_____ cfs or } \text{_____ \% of the Test Flood}$

* Prior to routing the inflow through Williams Pond Dam, it must be routed through Rocks 2nd Dam.

STORCH ENGINEERS
 Engineers - Landscape Architects
 Planners - Environmental Consultants

JOB Phase I Dam Inspection 4463

SHEET NO. _____ OF _____
 CALCULATED BY ODC DATE 5/27/81
 CHECKED BY QIG DATE 5/29/81

AREA - CAPACITY

Name of Dam: Rosers Pond Dam

ELEV	DEPTH	AREA	Avg. AREA	VOL	Σ VOL
176.5	1.5	1.7	3.0	4.5	4.5
178	2.0	4.2	6.8	13.6	4.5
180	10.0	9.3	2.0	230	18.1
190		36.7			248.1

ELEV. (ft)

Storage in pond @ 20' max elev. = 7 Acre

1895

1845

1795

Top of Dam
Spillway

1745

1695

1645

40 80 120 160 200 240

STORCH ENGINEERS
 Engineers - Landscape Architects
 Planners - Environmental Consultants

SHEET NO. _____ OF _____
 CALCULATED BY BOC DATE 5/27/81
 CHECKED BY GIG DATE 5/29/81

AREA - CAPACITY

Name of Dam: Rosers Pond Dam

ELEV	DEPTH	AREA	AVG. AREA	VOL	Σ VOL
176.5		1.7			
	1.5		3.0	4.5	
178		4.2			4.5
	2.0		6.8	13.6	
180		9.3			18.1
	10.0		12.0	23.0	
190		36.7			248.1

ELEV. (ft)

Storage in pond @ 20' water elev. = 7 Acft

189.5

184.5

179.5

Top of Dam

Spillway

174.5

169.5

164.5

40

80

120

160

200

240

Phase I Dam Inspection - #4463

STORCH ENGINEERS
 Engineers - Landscape Architects
 Planners - Environmental Consultants

JOB 80C OF 5/28/81
 SHEET NO. 1 CALCULATED BY GNG DATE 5/29/81
 CHECKED BY

Determination of Test Flood

NAME OF DAM Williams Pond Dam

DRAINAGE AREA 0.1 SM Independent, 2.2 SM Total

INFLOW Size: Small

Hazard: High

Test Flood: $\frac{1}{2}$ FMF

$$\text{Inflow} = 2100/2 = 1050 \text{ cfs}$$

$$\text{Independent } Q = 0.1 \times 1050 = 105 \text{ cfs}$$

$$Q \text{ from storage Pond} = 205 \text{ cfs}$$

$$\Sigma Q = 105 + 205 = 2110 \text{ cfs}$$

Estimating the effect of surcharge storage on the Maximum Test Flood

$$1. Q_{P1} = 2110 \text{ cfs}$$

$$2a. H_1 = 5.6' \text{ (elev.)}$$

$$b. \text{STOR}_1 = 0.37$$

$$c. Q_{P2} = Q_{P1} (1 - \text{STOR}_1/9.5) = 2030 \text{ cfs}$$

$$3a. H_2 = 5.5 \text{ } \text{STOR}_2 = 0.36$$

$$b. \text{STOR}_A = 0.365$$

$$Q_{PA} = 2030$$

$$H_A = 5.5' \text{ } \text{STOR}_A = 0.36$$

$$\text{Test Flood} = 2030 \text{ cfs}$$

Capacity of the spillway when the pond elevation is at the top of the dam

$$Q = 840 \text{ cfs or } 41\% \text{ of the Test Flood}$$

STORCH ENGINEERS
Engineers - Landscape Architects
Planners - Environmental Consultants

JOB **Phase I Dam Inspection 4463**

SHEET NO. _____ OF _____

CALCULATED BY EDC DATE 5/18/81

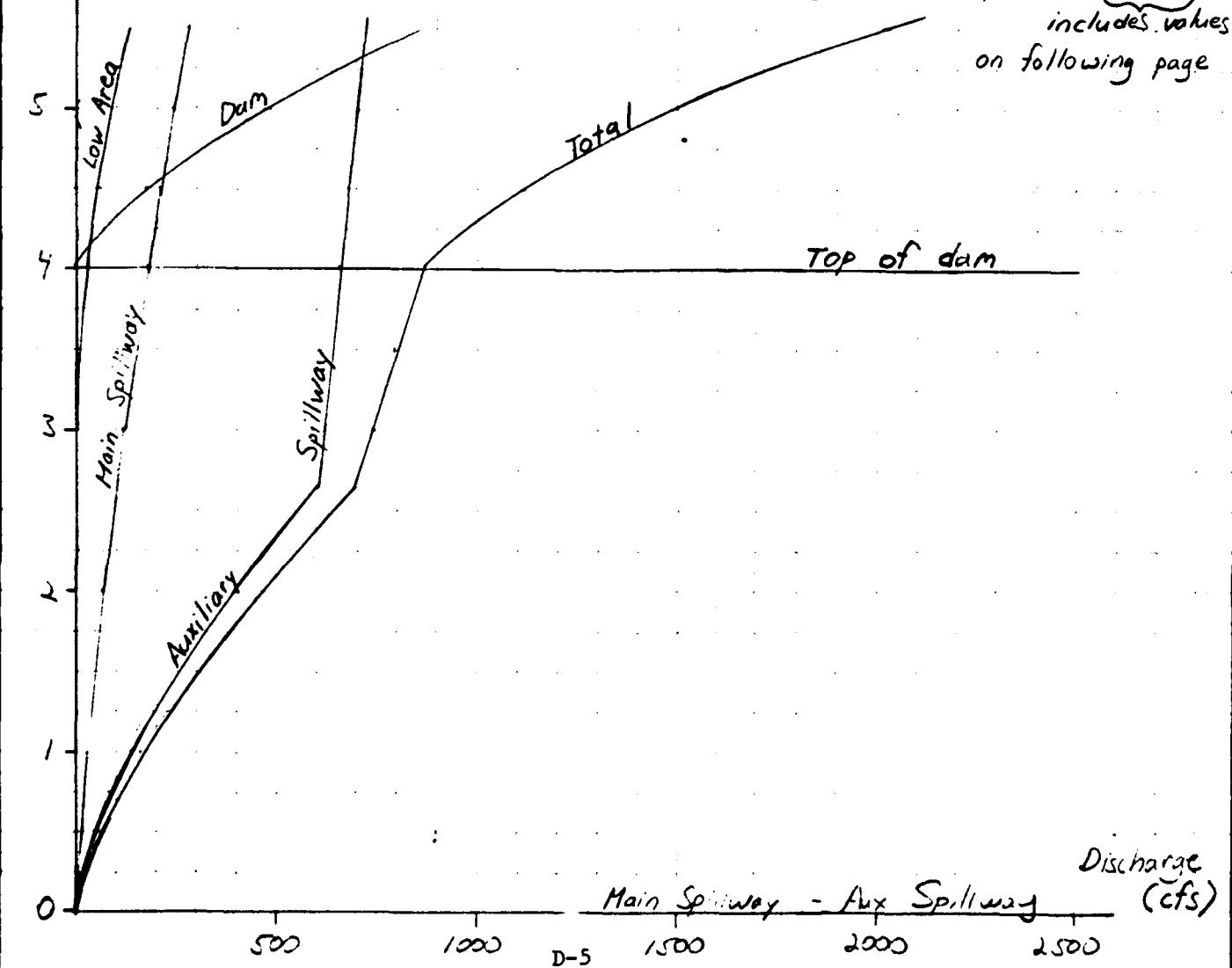
CHECKED BY GJG DATE 5/29/81

Stage Discharge 1 of 2

NAME OF DAM Williams Pond Dam

$$Q = CLH^{3/2}$$

Elev	Spillway I				Spillway II				Dam				QT
	C	L	H	Q	C	L	H	Q	C	L	H	Q	
		8.0	0										
	2.7	0.5	8	2.7	53	0.5	53						61
	1.0	22							1.0	140			162
	2.0	61							2.0	400			461
	3.0	112							3.0	620	values from inlet		736
Elev (ft)	4.0	173							4.0	660	control to 84 inch		867
	4.5	206							4.5	680	RCF calculations on		1121
	5.0	241							5.0	700	page		1515



Job Phase I Dam Inspection 4463

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SHEET NO. _____ OF _____

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Stage Discharge 2 of 2NAME OF DAM Williams Pond Dam

Low area @ South end of Dam

 $Q = CLH^{3/2}$

Elev	Spillway I				Spillway II				Dam				QT
	C	L	H	Q	C	L	H	Q	C	L	H	Q	
0													
0.5													
1.0													
2.0													
3.0	2.7	11	0	0					Flow	4.0			
4.0			1.0	30					through	4.0	2.7	180	0
4.5			1.5	55					rectangular	4.0		0.5	172
5.0			2.0	84					opening	4.0		1.0	486

STAGE - DISCHARGE AT AUXILIARY SPILLWAY

use Exhibit 14-7 Nomograph from Bureau of Public Roads Jan 1963

Pipe diam. = 84", use groove end w/ headwall condition

Elev.	HW/D	Q	$Q = CLH^{3/2}$ for $C \approx 2.7$, $L = 53'$
0 (Spillway)	-	-	-
0.5	1.5	530	53
1.0	1.55	540	140 } ← controls
2.0	1.70	590	400 }
3.0	1.85	620 } ← controls 1145	745
4.0	2.0	660 } ← controls 1145	1145
4.5	2.05	680 }	1365
5.0	2.15	700 }	1600

Note that the inlet control to the 84 inch pipe begins to limit the flow at about 3 feet above spillway elev.

Show that outlet control does not govern

use exhibit 14-12 Nomograph "Bureau of Public Roads" Jan. 1963
 assume $n = 0.012$, length of 84" RCP = 200', 10' drop over 200' length
 see placed

for $Q = 660$ cfs $H = 12'$, assume maximum tailwater condition = 8'

$$\therefore HW = H + TW - drop = 12 + 8 - 10 = 10'$$

@ 660 cfs inlet control $HW = 2 \times 7 = 14'$ \therefore inlet control governs

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JOB Phase I Dam Inspection 4463

SHEET NO. _____ OF _____
 CALCULATED BY BOC DATE 5/28/81
 CHECKED BY GJG DATE 5/25/81

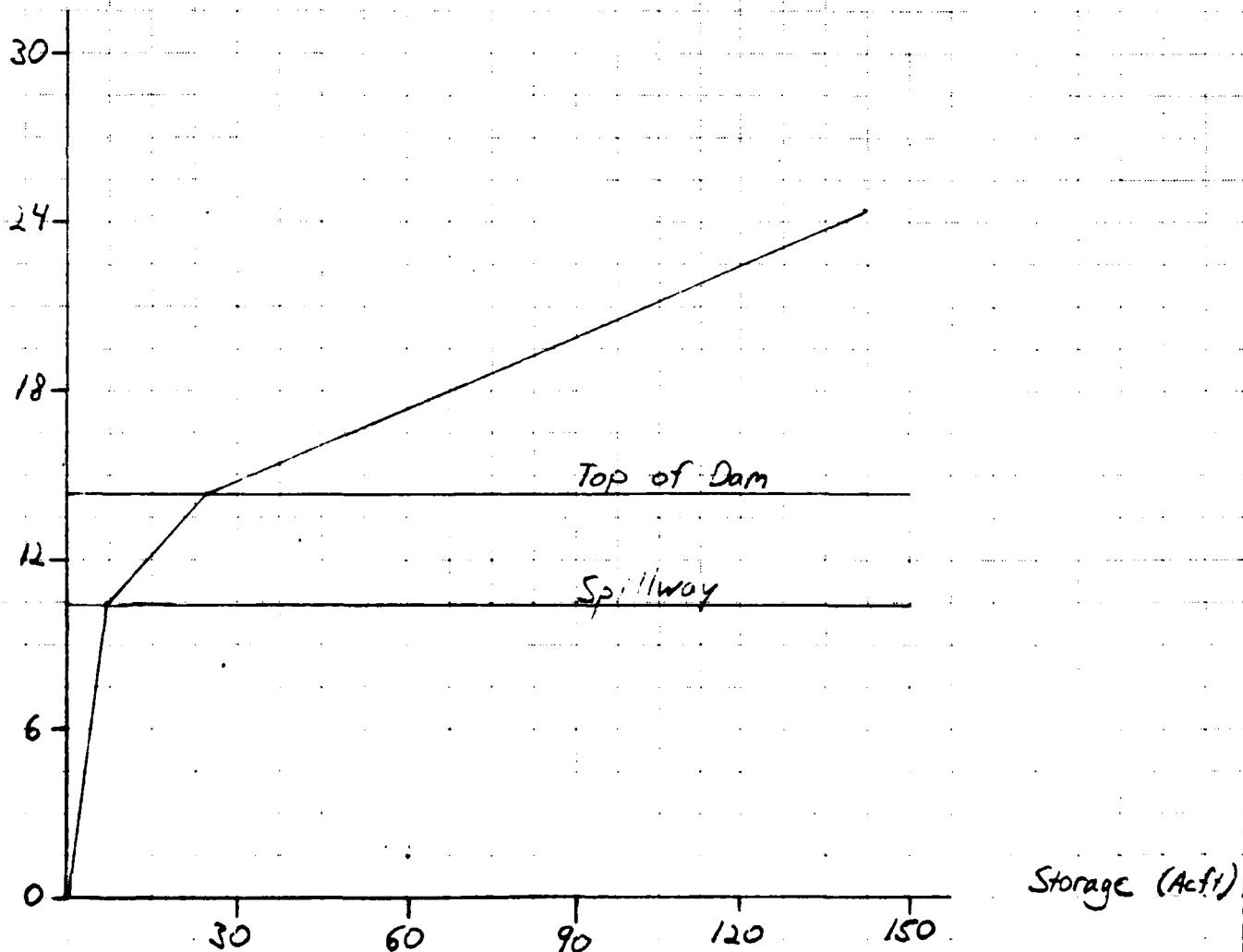
AREA - CAPACITY

Name of Dam: Williams Pond Dam

ELEV	DEPTH	AREA	AVG. AREA	VOL	X VOL
46	4	1.7			
50	10	72	4.5	18	18
60		16.1	11.7	117	
					135

Storage in pond @ spillway elev. = 7 Acft

Elev. (ft.)



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 CALCULATED BY POC DATE 5/26/81
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Downstream Hydrographs**"Rule of Thumb" Guidance for Estimating Downstream Failure Hydrographs**NAME OF DAM Williams Pond Dam**Section I at Dam**

$$1. S = \frac{25.0}{27} \text{ Acft}$$

$$2. Q_{p1} = 8/27 W_b \sqrt{g} V^{3/2} = \frac{8}{27} (32) \sqrt{3.2} (171)^{1.5} = 3805 \text{ cfs}$$

3. See Sections

Section II at

$$4a. H_2 = 12.5 \quad A_2 = \quad L_2 = \quad V_2 = 5.0 \quad \text{Acft}$$

$$b. Q_{p2} = Q_{p1} (1 - V_2/S) = 3045 \quad \text{cfs}$$

$$c. H_2 = 11.1 \quad A_2 = \quad A_A = \quad V_2 = 4.7 \quad \text{Acft}$$

$$Q_{p2} = 3805 (1 - \frac{4.7}{12.5}) = 3090 \text{ cfs}$$

$$H_2 = 11.26'$$

Section III at

$$4a. H_3 = \quad A_3 = \quad L_3 = \quad V_3 = \quad \text{Acft}$$

$$b. Q_{p3} = Q_{p2} (1 - V_3/S) = \quad \text{cfs}$$

$$c. H_3 = \quad A_3 = \quad A_A = \quad V_3 = \quad \text{Acft}$$

$$Q_{p3} =$$

Section IV at

$$4a. H_4 = \quad A_4 = \quad L_4 = \quad V_4 = \quad \text{Acft}$$

$$b. Q_{p4} = Q_{p3} (1 - V_4/S) = \quad \text{cfs}$$

$$c. H_4 = \quad A_4 = \quad A_A = \quad V_4 = \quad \text{Acft}$$

$$Q_{p4} =$$

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Culvert calculations for flow through
channel across walkway

JOB Williams Pond Dam

SHEET NO. _____ OF _____

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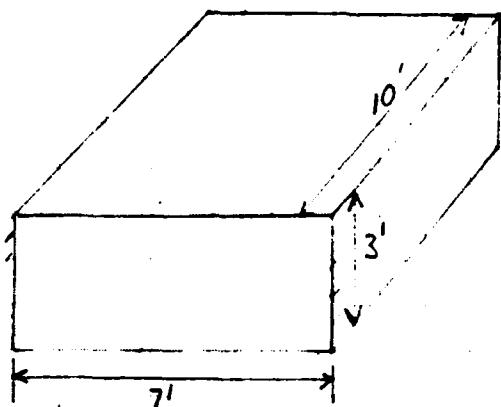
DATE 5/27/81

CHECKED BY GJG

DATE 5/29/81

SCALE _____

(1)



$$H = \left[\frac{1.555(1-K_c)}{D^4} + \frac{288n^2L}{D^{10/3}} \right] \left(\frac{Q}{10} \right)^2$$

$$n = 0.012 \quad K_c = 0.5$$

$$Y_c = 0.315 \sqrt[3]{Q^2/g} \quad Z = Q/ft. \cdot 0^2 \text{ width}$$

$$TW = (3 + Y_c)/2 \quad HW = H + TW$$

Q	H	TW	HW
100	.53	.57	7.1
200	2.1	2.1	3.0
300	4.8	2.1	6.9
500	13.5	8.0	21.5
750	30.0	8.0	38.0

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Culvert calculations for flow through
opening between buildings.

JOB Williams Pond Dam

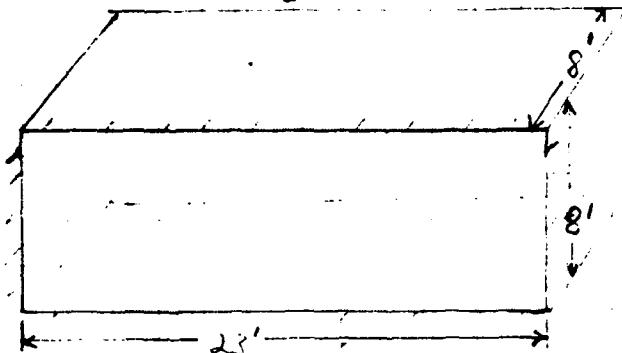
SHEET NO. _____ OF _____

CALCULATED BY BDC DATE 5/27/81

CHECKED BY GJS DATE 5/29/81

SCALE _____

②



$$C = 2.63$$

water flow up to 8'

Culvert flow above 8'

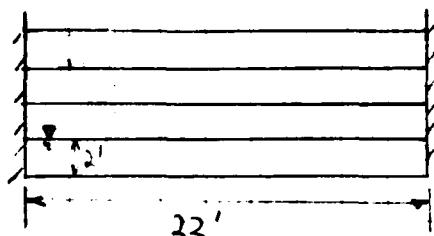
$$H = \left[\frac{1.555 (H_{c_e})}{D^4} + \frac{288.1^2 L}{D^{16/3}} \right] (Q)^2 \quad n = 0.012 \\ k_e = 0.5$$

$$HW = H + TW$$

H_w	Q	H_c	TW	HW
0	0			
1.0	60			
2.0	170			
3.0	315			
4.0	485			
5.0	890			
6.0	1370			
7.0	1500	1.55	8.0	9.55
8.0	1750	2.1	8.0	10.1
9.0	2000	2.75	8.0	10.75

STORCH ENGINEERS - STORCH ASSOCIATESEngineers - Landscape architects
Planners - Environmental ConsultantsWeir Calculations for flow between
buildings north of normal flow channel

Williams Pond Dam

JOB _____ OF _____
SHEET NO. _____ OF _____
CALCULATED BY BDC DATE 5/26/21
CHECKED BY GJG DATE 5/29/21
SCALE _____

$$Q = CLH^{1.5}$$

$$C = 2.63$$

H	L	Q
2	22	160
4	"	460
6	"	850
8	"	1310
10	"	1830
12	"	2410
14	"	3030

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Stage - discharge curves for all flows
out of apartment complex area

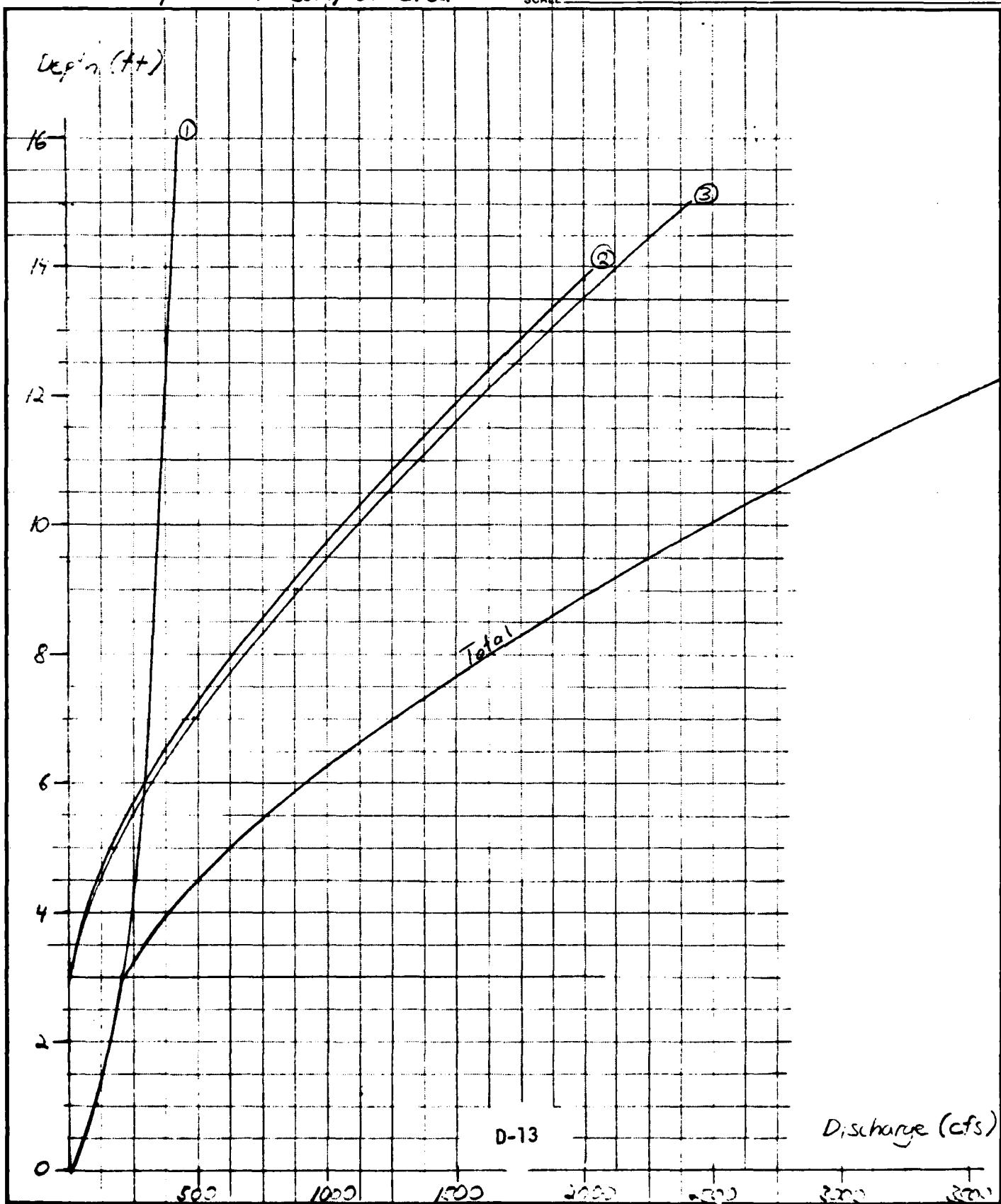
JOB Williams Pond Dam

SHEET NO. _____ OF _____

CALCULATED BY RLK DATE 5/27/81

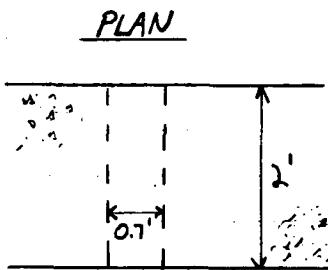
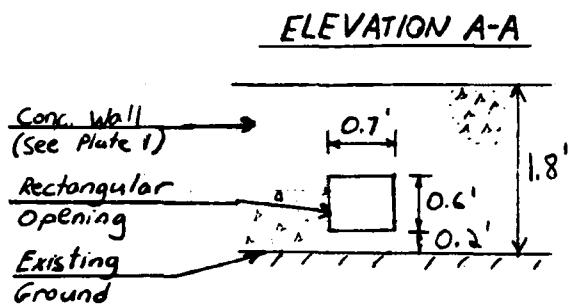
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SCALE _____



FLOW THROUGH RECTANGULAR OPENING IN CONCRETE WALL

Determine flow through opening



use inlet Control

$$HW/h = 2.67'$$

$$Q/b = 1.7 \quad b = 0.7'$$

$$Q = 1.2 \text{ cfs} = 540 \text{ gpm}$$

$$V = 2.85 \text{ fps}$$

Determine erosion due to flow through opening

use Connecticut Erosion and Sediment Control Handbook pg. 5.15

Kentucky bluegrass

0-5% slope

Assume intermediate k value ≈ 0.35

\therefore Permissible Velocity = 6fps

Initial velocity = 9fps but this will diminish quickly as water spreads out over the grass covering the top of dam. Therefore some erosion will occur at the outlet of the rectangular opening, but this location is well beyond the area where breaching could occur so there is no threat to the integrity of the dam

APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

END

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9-84

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